THE

Art of Shooting Flying

EXPLAINED.

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THE
Art of Shooting Flying:

CONTAINING

Directions for the Choice of GUNS:

Experiments diſcovering the Execution of Barrels of different Lengths and Bores.

With many uſeful Hints, for the Improvement of Young Practitioners, entirely new.

To which is now added,

The Method of Training, Breaking and uſing Pointers and Spaniels, Rules for the Preſerving of their Health, and Receipts for the Diſorders they are moſt liable to.

Alſo Abſtracts of the late Acts of Parliament relating to Game.

Shewing the ſporting Seaſons, the Times of the Day for killing Game, and the Dog Act, with an Index to the Whole.

The Fourth Edition.

By T. PAGE, Norwich; K

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M.DCC.LXX.

Advertiſement.

THE Author has been obliged to many experienced ſportſmen for their favorable commendations of the firſt edition of this pamphlet: and, at the requeſt of ſeveral, has here added ſome account of the compoſition and qualities of gunpowder: alſo a method of finding the relative velocities of ſhot from guns of different lengths and bores to one another, and their abſolute velocities; ſo that the goodneſs of barrels, in regard to carrying the ſhot with force, needs be no longer a diſputable point; as every one will hereby be enabled to prove it with as much exactneſs as he can deſire.

Here is an account of various experiments made for that purpoſe: alſo the reſiſtance of the air is conſidered on ſhot of different ſizes. All algebraic ſymbols are avoided; ſince it is more convenient for the uſe of moſt readers to put, inſtead of ſuch marks, words at length: and it is hoped that the whole is now explained in ſo eaſy a manner, as will be apprehended by thoſe who are not acquainted with mathematical operations.

As the writer of the following letter to the Author ſeems to be of a different opinion from him with regard to the proper ſize of ſhot; it is publiſhed in hopes that this diſputable point is ſatisfactorily diſcuſſed at the latter end of the appendix, where the reſiſtance of the air on different ſurfaces is treated of.

Letter to the Author.

SIR,

HAVING juſt peruſed your Treatiſe upon the Art of Shooting Flying, I trouble you with this to thank you for the pleaſure it gave me. What you recommend with regard to the lengths and bores of guns, as alſo the method of loading, correſponds nearly with what experiments had taught me was moſt effectual. The quantities of powder and ſhot I uſe are the ſame; but inſtead of No. 4. I ſhoot at all kind of game with No. 6. about 340 of which make an ounce, and kill, I think, with more certainty than larger, as there is the greater chance ſome ſhot will ſtrike the mortal part, and with force ſufficient: for I am of opinion that nine out of ten birds are killed within thirty yards of the gun, notwithſtanding you ſo frequently hear of ſhoots at a much greater diſtance. You hit your mark indeed with larger ſhot, but if you do not touch the head, the wings, or the thin part of the ſide, which is only expoſed to you in croſs ſhoots, the bird (however wounded in the thighs, or or the more fleſhy part of the belly) eſcapes you, and lives, or dies in miſery.

I am, Sir, &c.

R. BROCKLEBANK.

Chapelthorpe, near Wakefield,
Yorkſhire, June 23, 1767.

THE
Art of Shooting Flying
EXPLAINED.

FRIENDLY.

MR. Aimwell, your ſervant. I think it is as great a rarity to find you abroad as it is ſome people at home. And yet you often talk of ſhooting; but I don't ſee when you find leiſure.

AIMWELL.

The nature of my buſineſs, Sir, requires as much appplication of my hands as poſſible. 'Tis true I am fond of ſhooting, and perhaps the more ſo as the exerciſe has been of great uſe to me, in carrying off ſome diſorders which are frequently the conſequence of too cloſe application to a ſedentary buſineſs: ſo that I think four or five hours in a week ſpent in this diverſion is not thrown away, as it ſeems to give new vigour to the animal ſpirits, and enables me to return to buſineſs with greater chearfulneſs.

FRIENDLY.

What you ſay ſeems very reaſonable. I have thought for ſome time, a little of this exerciſe might afford me the like relief from ſtudy, as it does you from buſineſs; ſo that I have now prevailed on my father to indulge me in it, and am come with a deſign to purchaſe a gun of you.

AIMWELL.

Sir, I much commend your prudence in conſulting your father, and waiting for his approbation: it ſeems to promiſe that you will not abuſe this indulgence to the hindrance of your ſtudy, or hurt of your conſtitution; for moſt things, and even the beſt, may, and do often become detrimental when uſed to exceſs.

FRIENDLY.

I think myſelf obliged for this hint, which ſhall not be loſt on me. But I have ſomething more to claim from an old promiſe, which I ſhall eſteem a particular favour; that you will give me ſome inſtructions in the art of ſhooting flying, that I may be able to uſe the inſtrument I am going to purchaſe, to your credit as well as my own

A I M W E L L.

Sir, the reſpect I bear to you and your family will readily diſpoſe me to any thing in my power to ſerve you. And as you are come to ſpend ſome weeks here, now the ſhooting ſeaſon is juſt coming on, I don't doubt but, if you will ſubmit yourſelf intirely to my directions, I ſhall put you in a method, by which you may with practice become a markſman. But to attain that muſt be a work of time. I aſſure you, from the little leiſure I had to practiſe, it was ten years before I became a tolerable markſman; tho' indeed I had not the advantage of a good inſtructor. But from the experience I have had, I hope to put you in a readier way to this attainment.

F R I E N D L Y.

I ſhall be greatly obliged to you. But as to the gun, what length of barrel would you adviſe to begin with.

A I M W E L L.

It is neceſſary for any gentleman who ſports much to have two guns: the barrel of one about two feet nine inches, which will ſerve very well for the beginning of the ſeaſon, and for wood-ſhooting; the other about three feet three inches, for open-ſhooting after Michaelmas: the birds by that time are grown ſo ſhy, that your ſhoots muſt be at longer diſtances. But if you intend one gun to ſerve for all purpoſes, then a three feet barrel (or thereabouts) I think moſt proper.

FRIENDLY.

I have heard ſome of my acquaintance talk of guns of two feet ſix inches in the barrel that will kill at fifty or ſixty yards. Nay, I heard one aſſert, that he threw ſix ſhot into a quarter of a ſheet of paper at a hundred yards diſtance.

AIMWELL.

Well, Sir, I am not ſurpriz'd you have heard of theſe great things. I am frequently told ſtories to the ſame purpoſe. But there is nothing gentlemen ſeem more prone to than impoſing on themſelves and others in the diſtances they ſhoot at. I know you have a taſte for mechanical experiments, and therefore don't doubt but you will make uſe of that way of reaſoning, as a ſtandard to regulate your judgment at the firſt ſetting out, in this as well as other branches of knowledge. And tho' in this art every thing will not admit of mathematical demonſtration; yet I ſhall not demand your aſſent, but as it ſhall appear reaſonable from experiments; and hope you will not forget ſomething that is ſimilar to it when you become a teacher of men. If you can call on me by ſix in the morning, I will attend you to a proper place, and try ſome experiments of guns of different lengths, to give you a ſufficient idea of what can be done by guns in general, and to prevent your being impoſed on by every idle prater on this head.

FRIENDLY.

I am already obliged for the favour of this converſation, and will attend at your time: 'till when, adieu.

AIMWELL.

Your ſervant.

Dialogue II.

FRIENDLY.

GOOD-MORROW, Mr. ——

AIMWELL.

Sir, I hope you are well. You are very punctual, to be here rather before the time appointed.

FRIENDLY.

I knew you were an early riſer, and am deſirous you ſhould think me diligent to receive your inſtructions: but am ready to wait your leiſure.

AIMWELL.

Sir, it gives me pleaſure to ſee you ſo alert: for as to ſluggards, there is nothing to be made of them. But come, Sir, I am ready. I ſee you have brought your ſervant with you, whoſe attendance may be uſeful: and I have a man who is a very good hand at ſhooting at a dead mark. For my part, I am not fond of it: for guns ſeem to recoil more at a fixed mark than at a flying object; and I am apt to lay my face ſo cloſe as to get a ſmart blow on the cheek-bone, eſpecially if the barrel lies too ſtrait in the ſtock. I have choſe ſeveral guns, from two feet ſix inches to three feet ſix inches, which I think is the greateſt variety requiſite for ſhooting flying. And here comes my man with a quire of large brown paper, chalk, a hammer, and nails. Pleaſe to let your ſervant take ſome of the guns, and pen, ink, and paper, for you to take down what I ſhall direct.

FRIENDLY.

Is it far to this Place?

AIMWELL.

We are juſt by it: you ſee my man, who went before, is nailing up a ſheet of paper, and has chalk'd a place in the middle of it to take aim at.

FRIENDLY.

But pray of what uſe are thoſe long ſplines?

AIMWELL.

They are two ten feet ſplines, for the greater eaſe and exactneſs of meaſuring the diſtances we ſhall try the guns at. He has meaſured the diſtance of ſix ſplines, and put down a mark there for twenty yards. Now, Sir, if you will paſs over this diſtance two or three times, 'till you can do it pretty exactly at twenty paces, and the ſame when he has meaſured thirty, forty, and fifty yards, it will be of great uſe to you by and by to learn to judge of the true diſtances you ſhoot at; and therefore you may practice the like whenever you have opportunity.

FRIENDLY.

Pray what is your method of loading? I have been told that gunſmiths in general put in a large quantity of ſmall ſhot, to make them fill the paper well that they ſhoot at.

AIMWELL.

'Tis very true, indeed, they are often obliged to it, when gentlemen won't be ſatisfied with what is reaſonable for a gun to do; and it is a common practice in this country to load with a pipe bowl of powder, and a bowl and a half of ſhot; and when they find they can't kill often, think they don't put ſhot enough, ſo put in more, and are obliged to leſſen the quantity of powder to prevent its recoiling; not conſidering this axiom, "that action and re-action

“ re-action are equal”—that upon diſcharge of powder the gun is forced back, as the ſhot is forwards, in proportion to the weight of ſhot to the weight of the gun; ſo that by putting in a larger load of ſhot, and leſs powder, you will be ſtruck more, and the bird you ſhoot at leſs; ſo that tho' you put many ſhot into the bird, they will not have force enough to kill, unleſs at a very ſhort diſtance. I have been told by a gentleman, who is reputed to ſhoot very well, that when he is diſpoſed to kill at very long ſhoots, he puts in a leſs quantity of ſhot than powder, becauſe he thus finds them more efficacious. But if leſs of ſhot than powder will carry the ſhot cloſe enough for long ſhoots, they will certainly fly thick enough at ſhorter diſtances. To avoid the extremes, I uſe the beſt powder, and put in equal meaſures of that and ſhot, which in weight is nearly as one to ſeven, but uſually prime out of that quantity. To a barrel of a middle-ſized bore, whoſe diameter is about five-eighths of an inch (which I look upon to be the beſt ſize for ſhooting flying) I put in two ounces of ſhot, No. 4. which are about 200 in an ounce, and an equal meaſure of powder. This is the charge I uſe in the field, and ſhall make uſe of the ſame in our trial: for it is prepoſterous to make uſe of a load expected to make a better ſhoot at a mark, than when you deſign to kill a bird.

FRIENDLY.

And what ſort of wadding do you beſt approve of? I have heard ſome ſay that tow is beſt; others cards ſtamped, to fit the ſize of the bore.

AIMWELL.

Tow, I think, is uncertain. If cards be uſed, the end of your rammer muſt be almoſt as broad as your barrel will admit of, to go down free, and quite flat at the end, to prevent the card from turning; and muſt be puſh'd down gradually, to give time for the air to paſs, otherwiſe it will be troubleſome. This is therefore not the quickeſt way. Old hat may be uſed in the ſame manner, which is rather better: and ſome ſay leather ſhreds are beſt. But I can not yet find any thing better, or ſo ready, as thin brown paper, rubbed ſoft, and cut into pieces about one inch broad and two inches long; ſo that when it is once doubled, it is an inch ſquare. I punch a ſmall hole at the corner of each piece, put a ſufficient quantity upon a key-ring, hang them into my button-hole, and tear off one as I want it. This being doubled, put it to the muzzle, and cloſe the corners up about your rammer (the end of which ought to continue of the ſame bigneſs for at leaſt half an inch, or rather ſomewhat ſmaller juſt at the end) and thruſt the paper thus put into the barrel gently down upon the powder. Your rammer will come back without danger of drawing the paper back, and will leave it clos'd againſt the ſides of the barrel, like a half cartridge. Put in another in the ſame manner after the ſhot. When your gun is quite clean, it is neceſſary to put in a ſecond wad after the ſhot, to preven its getting looſe.

FRIENDLY.

Do you ram your ſhot as much as your powder? I think I have heard ſome that pretend to experience ſay, that they ram the powder well but not the ſhot. What is your opinion of this?

AIMWELL.

After ſome experience you will find, if your gun is clean, and the wad thruſt but lightly down, that in walking the ſhot will be apt to get looſe: and if you diſcharge the piece in that ſtate, it will ſeem, by the ſmall reſiſtance it makes, as if there were no ſhot in it: and if you try one load pretty ſmartly rammed over the ſhot, and another with the wad thruſt but lightly down, at a quire of paper, you will find the charge that is rammed will penetrate deepeſt, and that the ſhot will fly as regularly as the other which is not rammed.

FRIENDLY.

Well, Sir, it ſeems rational enough; and I ſhall follow your counſel, and try it the firſt opportunity.

portunity, becauſe I think it a point neceſſary to be thoroughly convinced of.

AIMWELL.

The gun two feet ſix in the barrel is loaded; you ſee I have got a reſt to be the more exact in our trials: fire it at twenty yards.—Well ſhot.—Bring the paper this way, and draw three or four lines acroſs it with your chalk there. By this means you may eaſily count the ſhot-holes; which pleaſe to do, whilſt I load it again, and put down,—The gun two feet ſix inches long, the barrel ſix tenths and a half diameter, weight two pounds fourteen ounces, and weight of the whole gun ſix pounds two ounces:

The firſt ſhot at 20 yards,	196	Medium	208
Second at ditto - -	220		
Firſt of ditto, at 30 yards,	104		94
Second at ditto - -	84		
Firſt of ditto, at 40 yards,	35		29
Second at ditto - -	23		
Firſt of ditto at 50 yards,	16		20
Second at ditto - -	24		

By the ſhoots made with the gun, you may eaſily perceive it is difficult to make two ſhoots alike: and therefore no certain judgment can be made of its goodneſs by two or three ſhoots. For inſtance, the ſhoots here made at forty yards, are not much above half the number of ſhot there ought to be in proportion to thoſe at twenty and fifty yards, as you will ſee upon further trials.

No. 2. A barrel two feet nine inches, weight three pounds two ounces, weight of the whole gun ſix pounds five ounces; bore, ſix tenths and a quarter.

Firſt ſhot, at twenty yards	218	Medium 220
Second. at ditto - -	222	
At thirty yards - -	115	119
Ditto - - -	123	
At forty - - -	68	64
At ditto - - -	64	
Ditto with hat wad -	62	
Ditto, at fifty - -	40	38
Ditto - - -	36	

The powder and ſhot took up two diameters and three quarters each in the barrel.

No. 3. Of a gun whoſe barrel is three feet long, and two pounds fifteen ounces weight, the bore is ſix tenths and a half of an inch diameter, and is nearly a cylinder, 'till within three inches of the muzzle, which is opened a little; the weight of the whole gun five pounds thirteen ounces.

Firſt ſhot, at twenty yards,	238	Medium 229
Second, at ditto	228	
Firſt, at thirty yards	48	54
Second at ditto	60	
Firſt, at forty yards	36	53
Second, at ditto	50	
Third, at ditto	40	
Fourth, at ditto	86	
Firſt, at fifty	40	43
Second, at ditto	46	

No. 4. Of another gun, barrel three feet long, and ſix tenths and three quarters diameter; weight three pounds three ounces; and whole weight of the gun ſix pounds ſix ounces.

Firſt ſhot, at thirty yards,	120	Medium 125
Second, at ditto	130	
Firſt, at 40 yards	45	45
Second, at ditto	46	
Firſt at fifty yards	26	32
Second, at ditto	38	

No. 5. Of a gun the barrel three feet and two inches long, the bore ſix tenths and three quarters diameter; two ounces of ſhot loaded it, two diameters, and the ſame quantity in meaſure of powder; weight of the barrel three pounds twelve ounces; the whole gun ſeven pounds three ounces.

Firſt

Firſt ſhot, at twenty yards	216	Med. 260
Second at ditto - - -	304	
Firſt, at thirty yards - - -	142	122
Second, at ditto - - -	96	
Do. without any wad betwixt ſhot and powder - -	129	
Firſt, at forty yards - - -	94	79
Second, ditto - - - - -	60	
Do. with four hat wads betwixt the powder and ſhot - - -	70	
Do. with a ſingle wad betwixt powder and ſhot - - - -	94	
Firſt of ditto, at fifty yards -	32	52
Second ditto - - -	52	
Third ditto - - - -	74	

No. 6. Of a gun three feet and ſix inches weight three pounds ſix ounces; weight of the whole gun ſix pounds eight ounces; two ounces of ſhot, and the ſame quantity of powder loaded it, two diameters of each.

At thirty yards - - - -	146	Med. 148
Ditto - - - - -	177	
Ditto - - - -	116	
Do. without wad over the ſhot	154	
Ditto, at forty yards - -	60	82
Ditto - - -	94	
Ditto - - -	101	
Ditto - - - - -	70	
Ditto - - - - -	84	
Ditto, with a double wad -	86	

At

At fifty yards - - -	34	33
Ditto - - - -	31	
Ditto - - - -	33	

No. 7. A barrel three feet three inches long, weight three pounds twelve ounces, tried in a rough ſtock.

At thirty yards - -	144	144
At forty yards - -	59	Med. 76
Ditto with a hat wad - -	94	
At fifty yards - - -	33	38
Ditto - - - -	44	

No. 8. Another barrel three feet three inches long, weight three pounds ſeven ounces, and was fine bored; tried in the rough ſtock.

At forty yards - - -	94	Med. 97
Ditto - - - - -	100	
Ditto, with hat-wad -	95	

No. 9. A five feet barrel of the ſame bore and load.

At fifty yards - -	53	Med. 58
At ditto - - -	64	

No. 10, A real ſpaniſh barrel three feet eight inches long.

At thirty yards - -	110	Med. 103
Ditto - - - - -	96	
At forty yards - - - - -		60
At fifty yards - - - - -		25

The owner of this gun ſhoots well, and he ſays he frequently kills with it at ſeventy yards; but unleſs he put in more powder and ſhot, I think there is but little chance for killing at fifty yards with any certainty.

No. 11. One ditto three feet two inches, ſeven tenths diameter.

At forty yards - - - - -	77
At fifty - - - - - -	28

No. 12. A four feet barrel, ſix tenths and a half diameter.

At forty yards - -	84	Med. 77
Ditto - - - -	58	
Ditto - - - -	73	

Ditto, after cutting eight inches off the barrel.

At forty yards. - - -	50	Med. 45
Ditto - - - - -	32	
Ditto - - - - -	54	

Upon ſuppoſition that a gun loſes half the quantity of ſhot every ten yards, (and it appears from the experiments to be nearly ſo) this gun has loſt about a yard diſtance in killing, to one inch taken off from the length of barrel: but the difference of the force with which the ſhot were thrown was ſcarcely diſtinguiſhable.

No. 13. The ſecond-beſt barrel, three feet three inches, Spaniſh faſhion, fixed into a block.

At forty yards	71
Second ditto	62
Third ditto, card over the powder, and paper over the ſhot	39
Fourth, without any wad over the powder	70
Fifth ditto, more wad over the ſhot	85
Sixth do. double wad over ſhot and powder	56
There were, at the firſt three ſhoots, put into the target, being a round of three feet diameter, which the papers were nail'd to	426
The laſt three ſhoots which were made on the other ſide of the target, and the ſhot ſeem'd to be thrown in with nearly the ſame force on each	471

No. 14. A barrel, Spaniſh faſhion, weight four pounds two ounces; three feet ſix inches long.

At forty yards	75

No. 15. A barrel, Spaniſh faſhion, weight three pounds four ounces; three feet ſix inches long.

At thirty yards	110	Med. 113
Ditto at ditto	116	
Ditto at forty		64

AIMWELL.

It appears from various other trials beſide theſe, which I have made, that the ſhot fly as regularly, or more ſo, and with as much force without any wad betwixt the powder and ſhot, as it does with wad only. 'Tis difficult to keep the ſhot from mixing with the powder; and when it does, that will affect it: but it proves thus much at leaſt, that it does not ſignify how thin your wad is betwixt the powder and ſhot, ſo it does but keep them from mixing. But the ſhot fly the thicker and ſtronger from having a pretty good wad cloſely ramm'd over them. - - - -

FRIENDLY.

I am pleaſed with theſe experiments, as they have given me a better idea of the manner of barrels carrying ſhot than I could have imagined. I ſhall now be oblig'd for your opinion, whether Spaniſh barrels are really better than Engliſh ones of the ſame weight, as I find they are ſo eſteemed by many gentlemen.

AIMWELL.

The repute of the Spaniſh barrels aroſe chiefly from their lengths, being in general about three feet eight or ten inches long, of a ſmalliſh bore, and that nearly a cylinder; by which means the force of the powder is continued longer upon the ſhot: and I have already ſhewn you, that length of barrel will do more than weight. I have try'd a good many ſpaniſh barrels very carefully, and could never find them to carry the ſhot better than thoſe made in England of the ſame form and ſize. (But the foreigners have found out our foible in that as in moſt other of their rarities; that is, if they are but far fetch'd, and dear bought, they are ſure to pleaſe.) The Engliſh form of making them very ſtout at the breech, is in order to balance them better in hand, and make them come eaſier to ſight. It anſwers in that reſpect; but then it makes them much heavier, upon the whole: and a ſportſman will not chooſe to carry more weight than is neceſſary. I have already ſhewn you, that from the preſent method of ſhooting flying, we have no occaſion for guns to kill ſo far; and therefore ſhorter and lighter guns will better anſwer our purpoſe, as they are readier to come to ſight, and will kill far enough.

FRIENDLY.

I ſee you have a great variety of guns of different lengths of the Spaniſh form; which with what you have ſaid, makes me think you rather give the preference to the Spaniſh form.

AIMWELL.

Indeed I do, for ſeveral reaſons. Firſt, I never ſaw a gun of the Spaniſh form burſt near the breech, tho' many of them are very ſmall or weak: thereſore 'tis not neceſſary to add ſuch a quantity of metal on account of ſtrength; it can be only with a deſign to balance it the lighter forward. But as barrels of common lengths will balance very well, it anſwers no good or uſeful purpoſe to make barrels ſo ſtout at the breech. Again, they often draw thoſe barrels thinner forward about the middle, in order to make them the more handy, and to look neater; tho' I think it no addition to its beauty, and this will take off from the force the ſhot is carried out with: ſo that a barrel of the Spaniſh faſhion, continued with a more regular thickneſs will kill farther than one of a greater weight where there is more metal than is neceſſary at the breech, and too thin forwards. Another diſadvantage in a barrel ſo made, is, that it will be bigger and clumſier about the lock part, and the ſtock will not have ſtrength enough. For if you take notice, you will find the ſtock ſplit with a little uſe from the breech to the foreſide nail, oftener in theſe than in thoſe of the Spaniſh faſhion, where there is room to leave the ſtock ſtronger, without making it clumſy. But I would not have you imagine, that I approve of barrels too thin at the breech. I would have them of proper ſubſtance for ſtrength in every part, and ſo as to balance properly. I have experimentally ſeen a good killing barrel loſe much of its in carrying ſhot, by filing it thinner; which ſhews that barrels ought not to be drawn ſo thin; ſince a tolerable ſubſtance is neceſſary both to carry the ſhot ſmartly, and for ſafety.

FRIENDLY.

Since you are ſo ready and free to inform me, if I am not too inquiſitive, pray explain to me why the bore you mentioned, of about five eighths of an inch diameter, is the beſt ſize for ſhooting flying? ſince the generality of barrels appear to me to be much larger.

AIMWELL.

'Tis very true that birding guns in general are of a larger bore: but if you judge of them by the ſize at the muzzle, they appear to be much larger than they really are, many of them being much opened at the muzzle, and gradually leſs for about a foot, and then continue nearly a cylinder to the breech. This form is uſed to make them carry the ſhot cloſer by letting them open gradually in coming out. The reaſon ſeems plauſible, and ſometimes appears to have ſome effect, when open'd gradually a ſmall matter. But there is no reaſon to open them too much; for in that caſe the fire will have room to paſs off on each ſide all round the wad, when it comes to the part much wider, and then loſe of its force, and may alſo mix with the outermoſt part of the ſhot, and cauſe them to ſcatter the more from a true direction. Many barrels are again open'd a little wider gradually towards the breech, in order to carry ſhot with greater force, by firſt meeting with ſome reſiſtance, and then paſſing free: (and alſo that the whole quantity of powder may take fire quicker.) This has alſo appeared to me to anſwer the effect deſired: and yet I have met with barrels that have been as nearly a cylinder as poſſible in the bore, yet have carried the ſhot as round and as ſtrong as any other. For which reaſon, I practiſe opening them but very little, and gradually at each end, as I ſee occaſion; which method I think anſwers beſt. As to the ſize, 'tis certain there muſt be a fixed bore, which carries a particular load better than any other. Now, as ſhooting flying is very difficult for ſome to attain, and even the beſt markſmen have oftentimes their miſcarriages, they are willing to make uſe of as large a load as they can, without hurting themſelves: and therefore ſome will chooſe a large bore, thinking it will carry a larger load. 'Tis very true it will require a larger load; but then the gun muſt be heavier in proportion to the load, or (as I have already obſerved) they will be hit harder, and the bird not ſo hard. If two ounces of ſhot, and the ſame meaſure of powder be thought ſufficient (and I think it is ſo for any ſort of game) then a barrel, whoſe bore is about five eighths of an inch (or rather a little more) diameter, will be loaded about two diameters and a half of each, and the of the gun may be about ſix pounds. But thoſe who will ſhoot with two ounces and a quarter of the ſame meaſure of powder, muſt carry a gun of about ſeven pounds, which will ſeem heavy to moſt people after three or four hours walk. Indeed, I have known two ounces and a half, and three ounces of ſhot, made uſe of to a gun under that weight: but then a ſmaller quantity of powder was uſed, and conſequently could not be ſo efficacious as a ſmaller quantity of ſhot, and equal meaſure of powder: and if a ſmaller bored barrel is loaded too deep, tho' the gun be heavy enough, the ſhot would not be thrown cloſer than they would be with a proper load: that is, about two diameters and a half of each. And if a larger bore have not its proper load, it will not kill ſo ſmartly as the ſame load in a bore proper for the load. There are but few who will care to ſtand before a proper load for a barrel ſix eighths of an inch diameter, except poachers, who are covetous of killing every thing, and will ſtand the bruiſing for a ſmall advantage: but fair ſportſmen are not ſuch ſpit-hunters; they purſue for the ſake of diverſion, and to ſhow their dexterity.

FRIENDLY.

I am greatly obliged for this account of barrels, which is fuller and more ſatisfactory than I expected. And now I think I may venture to chuſe a gun. There ſeems to be one of the ſize and bore you recommended.

AIMWELL.

'Tis very true, Sir. But you are not yet judge enough to chooſe a gun. There is more to be obſerved than the ſize and the bore of the barrel. That gun is made for a broad ſhouldered man: the ſtock is bent ſideways, as if you would lay the plate of the lock upon your knee, and with your hands could bend it; and the point or toe of the butt turns out a little to the right, ſo as to bring the breech of the barrel to his eye in a direct line with the muzzle, without conſtraint or bending his head much, which a ſhort necked man cannot do without danger of hurting his face. If you pleaſe, give me leave to recommend this gun to you. The ſtock of it is of a middling bend and length, and quite ſtraight ſideways; which, as you are ſlender, and your neck ſomewhat long, will beſt ſuit you. The length of the butt from the breech is about fifteen inches and a half; and if a ſtraight ſpline is laid to the barrel, ſo as to touch the muzzle and breech, and continued to the butt, you will find that the butt drops about three inches from the line, (and for a man who has a ſhort neck, it ought to drop about a quarter of an inch more) and at about three inches from the butt, where the face touches, about two inches and a half; and if he is broad and ſtout, and his arms cannot reach ſo forward, fourteen inches or fourteen and a half in length from breech to butt may be ſufficient. Pleaſe to take hold of the gun, and balance it upon the fore finger of your left hand, (which is a proper ſituation for your left hand) then join your right hand with your fore finger, juſt to feel the trigger, your thumb upon the cock, and throwing it off a little ſpace from you in a horizontal direction, to prevent its rubbing againſt your ſhoulder. In taking up the gun, ſlip your thumb off the cock, and draw the butt to your ſhoulder, ſo as to feel it gently, and point the muzzle to any object; and if you find the breech in a line with the muzzle, without any conſtraint, it then lies very well to ſuit you. Now, if you obſerve, you will find, an error which many gunſmiths perſiſt in is here remedied: the trigger is hung at a right angle with the pull of your finger, and as backward as the guard will admit of: whereas the trigger is frequently hung to form a right angle with that part of the ſtock where it hangs; in which caſe the finger draws at a diſadvantage, being in drawing it forced cloſe to the ſtock; which poſition ſhortens the lever, and cauſes it to draw off harder than in this, where you find the finger more naturally ſlips to the end of the trigger, and lengthens the lever: and 'tis neceſſary to take the advantage of this as much as may be, in order to have a good ſear-ſpring, without which the lock cannot move well nor ſafely; for if the ſear-ſpring be made too weak, in order to make it draw off eaſy, it will then be ſubject to catch upon the half cock; and if it draw off too hard, you cannot be certain of ſhooting any flying object. Another diſadvantage which attends the trigger being hung too forward, is that the middle finger will be ſo near the guard as to receive a ſmall blow upon the diſcharge of the peice: I have ſeen many perſons who have had a callous ſwelling upon this finger from being batter'd by the guard through this defect. I think it neceſſary to give you this hint, as you may ſometimes have occaſion to ſhoot with other guns, or to make choice of a gun elſewhere.

FRIENDLY.

I believe I ſhall fix upon this gun, as it ſeems very handy to me, and comes eaſy to ſight. But pray be ſo kind as to inform me, if you have any objection to a barrel of two feet ſix inches, more than its carrying the ſhot: for the gun we try'd of that length ſeem'd to carry the ſhot very ſmartly and cloſe at 30 yards.

AIMWELL.

Your obſervation, Sir, is true: It threw in ninety ſhot, on a medium at thirty yards, into a ſheet of paper; which one may venture to affirm would kill a bird if held right, and it may ſometimes kill at forty yards. But pleaſe to take notice, that the weight of it was ſix pounds two ounces: and if you compare the ſhoots with thoſe made with the three feet gun, whoſe weight was but five pounds thirteen ounces, you will find them ſo much ſuperior, that it muſt evidently kill farther with the ſame load: which, I think, is one objection to your propoſal. The next is, ſhould a ſhort gun go off by an accident whilſt you are loading it, you are more expoſed to danger, as you will more naturally lean over the muzzle; which, however, in ſhort or longer guns ought always to be avoided. What has once happened may happen again. A gentleman, whom I knew very well, was out by himſelf a ſhooting, and juſt as he had loaded his gun (though he knew of no defect in the lock, 'till it was afterwards examined) it went off, and ſcalp'd him ſo as to leave the forehead bare to the ſcull. We may ſuppoſe he laid ſome time ſenſleſs. As ſoon as he recover'd a little, he ſaw his hat ſhot to pieces, and himſelf bloody: perceiving what had happened, he tied a handkerchief about his head, and walk'd home, and is now perfectly recovered.

FRIENDLY.

A narrow eſcape with life indeed! and I am greatly obliged for this caution. Indeed the frequent misfortunes which happen from guns, ſhew we cannot be too careful in the uſe of them: and I muſt agree with you, that we are not ſo much expos'd to ſuch an accident as this from a long gun as from a ſhort one.

AIMWELL.

There is one more objection, which I think an over-balance to the advantage, if it be thought one, of a ſhort gun's coming more readily to ſight, which is: though a longer gun requires a little more care to bring it to the object, when it is once brought it is not ſo eaſily put aſide as a ſhort one, nor does a little variation of the muzzle carry the ſhot ſo wide from the object as the ſame variation of a ſhort one does; which I think may be eaſily explained. Draw a line upon a ſheet of paper, and from a point, with a pair of compaſſes, cut the line at two inches and a half, and three inches and a half: from the ſame points of interſection, ſet off one-tenth of an inch from the line, and draw lines from the firſt point thro' each of theſe: then at about twelve inches from the three and a half, you will find it will vary about half an inch from the firſt line, and the other, which interſects at a tenth diſtance from the line at the two inches and a half, will at the twelve inches be found to vary about three quarters of an inch. Now, if you count a foot for an inch, the one will have varied ſix inches, and the other about nine inches, at the diſtance only of twelve feet; which I think plainly ly ſhews that a ſmall variation of a ſhort barrel will cauſe a greater error, which will encreaſe as the diſtance of the bird is farther from you. But if your barrel be too long and not ready to come to ſight; then your extraordinary lengths will not anſwer your expectations; as you may judge from the experiments we have made, that good barrels will not kill above a yard for an inch in length of barrel, from three feet to four feet in length: and therefore a barrel of three feet three inches, I think, anſwers the beſt.

FRIENDLY.

Well, Sir, you have ſufficiently ſatisfied me in all the queſtions I am at preſent able to aſk, as to the choice of guns: and I would not have been without this knowledge upon any account; as I am certain it will enable me to go on with eaſe and courage, and I ſhall ſooner become a proficient in the art of ſhooting flying. But, pray what is next to be done?

AIMWELL.

I ſhall now give you a ſhort leſſon, which will take you a long time to get: but I muſt firſt take the flint out of your gun, and put in a piece of wood of the ſame form, that you may not wear the ſteel of the hammer by frequently ſtriking it down. And now, Sir, take the piece, carry it upon your left arm, with the thumb of your right hand upon the cock, and fixing your eye upon any particular object, preſent the gun in the manner before directed, and in the motion of bringing it up cock it: do it pretty briſkly, but in no hurry, ſo as to confuſe yourſelf: in raiſing the cock take care that you preſent the muzzle as near as you can at once to the object, only rather below, that you may have a little matter to raiſe it, and as quick as you can: briſkly draw the trigger as ſoon as you have got an exact ſight at the object, and continue to keep your muzzle at it for ſome time after you have drawn the trigger, leſt your gun ſhould hang fire: which if it happen to do in a very ſmall degree, it will render your ſhot quite uncertain, eſpecially if your mark be moving towards right or left, or any way from the line: but by means of your keeping the gun in motion with the object, a ſhot may be ſometimes recovered though it hangs fire. This you may practiſe in your room, or when you walk, at any object ſteady or flying; and do it as often as you can conveniently, till you can readily get the object and draw down in proper time: by which means you will make a greater progreſs in one month than by the common method of ſhooting in a year or two.

It may not be amiſs now juſt to give you a hint concerning croſs-ſhooting: from the many ny experiments you have ſeen of guns carrying ſhot, you muſt have an idea how the ſhot ſpread at different diſtances.

A very good gun at twenty yards will ſpread the ſhot ſo, that in a circle of twelve or fourteen inches no bird can eſcape alive. Now, if the ſituation oblige you to ſhoot at a bird at this diſtance flying croſs, either to right or left; if you take aim ſix inches before it, ſuppoſing the bird not to have mov'd from the time of your drawing the trigger to the ſhot's hitting it, the bird will be entered far enough into the circle of the ſhot to be ſecured: but as the bird is in motion, it muſt have moved ſome way before the ſhot can reach it: ſo that 'tis moſt likely the bird will meet the center ſhot; and ſhould you be ſomething longer in drawing the the trigger, you will have the better chance for the rear-ſhot. From the ſame reaſoning, if you take exact aim at the bird, and draw briſkly, you may kill it with the rear-ſhot: but by obſerving the above method, you have double the chance, as the bird muſt paſs through the whole diſk of the ſhot. I think I have already remarked, from the experiments we have made, that the ſhot delivered from a gun in general loſe or decreaſe half the quantity every ten yards, or thereabouts; ſo that at forty yards there will not be thrown in above a fourth of what would be into the ſame ſpace at twenty yards. From which it appears, that if you take aim a foot before a croſs ſhoot at forty yards, you will be the moſt likely to meet the bird with the center ſhot; and which by the way I look upon to fly the ſtrongeſt, and to be more efficacious at long diſtances than the diverging ſhot: for whether it be the ſhot ſtriking againſt each other, or againſt the air, at firſt coming out of the muzzle, or whatever be the cauſe of their diverging, I think it muſt in ſome degree retard their motion. But if there be a briſk wind, it will certainly bend the courſe of the ſhot; you muſt therefore conſider, whether the wind blow with the bird, or againſt it: if it blow with it, you need little more than to obſerve the general rule; becauſe the wind helps the bird forward nearly as much as it diverts the ſhot: but if it fly againſt the wind, the ſhot decline more than the bird is retarded, and therefore you ought to take aim at a greater diſtance before the bird.

Theſe hints may be of ſervice; and from theſe you may judge of all other diſtances. Yet practice only can make you a maſter in this critical point, as alſo in the oblique ſhoots. For inſtance: ſuppoſe a bird at any diſtance from you flies off in a diagonal line; you muſt take aim but half as much before it as you would do in a croſs ſhoot at the ſame diſtance; and in the ſame proportion at a greater or leſſer angle. The different marks are very prettily deſcribed by an ingenious gentleman of St. John's College, ſome years ago, in a poem call'd PTERYPHLEGIA, which is ſo fit for the occaſion, that I ſhall give it you in his own words.

quo. Markland?

“ Five general ſorts of flying marks there are,
“ The lineals two, traverſe and circular;
“ The fifth oblique—which I may vainly teach;
“ But practice only perfectly can reach.
“ When a bird comes directly in your face,
“ Contain your fire awhile, and let her paſs,
“ Unleſs ſome trees behind you change the caſe.
“ If ſo, a little ſpace above her head
“ Advance the muzzle, and you ſtrike her dead.
“ Ever let ſhot purſue where there is room;
“ Marks hard before, thus eaſy will become.
“ But when a bird flies from you in a line
“ With little care I may pronounce her thine.
“ The unlucky croſs-mark or the traverſe ſhoot,
“ By ſome thought eaſy, yet admits diſpute.
“ As the moſt common practice is to fire
“ Before the bird, will niceſt time require;
“ For too much ſpace allow'd the ſhot will fly
“ All innocent, and paſs too nimbly by:
“ Too little ſpace, the partridge ſwift as wind,
“ Will dart athwart, and bilk her death behind.
“ This makes the point ſo difficult to gueſs,

" 'Cauſe you muſt be exact in time, or miſs:
" Full forty yards, or more, to left or right,
" The partridge then obliquely takes her flight:
" You've there the advantage of a ſideling line;
" Be careful, nor her inward ſide decline.
" Thus in the mark is ſtiled circular,
" There's nothing more requir'd but ſteady care,
" T'attend the motion of the bird, and gain
" The beſt and fartheſt lineal point you can;
" Carrying your piece around, have patience 'till
" The mark's at beſt extent, then fire and kill.

* * *

Dialogue III.

FRIENDLY.

WELL, Sir, for this week ſince I ſaw you, I have much practiſed the leſſon you gave me, and believe it will be of great uſe to me; for I find that I can already point the gun to any object very readily.

AIMWELL.

Sir, I don't doubt your application; and ſhall now put a flint into your gun, and recommend it to you to practice ſome time the ſame method with a little prime, and then with a ſmall load of powder; which may not improperly be term'd, teaching you to ſtand fire, without the leaſt ſtarting; which is a thing very material towards the becoming a good markſman. When you are perfect in this, you may ſhoot at a mark at twenty yards, with half a charge, or a little more. By degrees, as you find you can do it well, without any fear or uneaſineſs, repeat the ſame at thirty yards, with about three quarters of a charge.

FRIENDLY.

I am oblig'd for this leſſon. I ſhall call on you again in about a week; in which time I don't doubt but I ſhall be able to handle the gun pretty dexterouſly.

AIMWELL.

I believe you will ſoon make a progreſs in ſhooting; but I have juſt thought of a method, which I ſhall now inform you of, by the practice of which you may be able to become a tolerable markſman at your firſt going into the field. Get a target made of a piece of board; let it be round, and about three feet diameter; put a ſtaple into the edge of it to hang it up by; get a ſpline ten or twelve feet long, and to one end of it fix a hook to hang the target on, and near the other end make ſeveral holes to hang it to an iron pin, which is to be fixed up in a convenient place at a proper height, ſo as the target when hung on it be ſuſpended ſometimes a little higher, and ſometimes lower than a point blank mark. This is to be put in motion like a pendulum, and you may ſhoot at it whilſt it is moving, either to the right or left, with about half a load, at twenty yards diſtance; and by the breadth of the target, you will eaſily ſee how the body of the ſhot went, either before or behind the mark, and the next ſhoot you may take aim accordingly. It will be neceſſary that you prepare ſome whitening, that you may with a bruſh cover your ſhots every time before you ſhoot again; and with a piece of charcoal, you may make a mark to take aim at. You may alſo ſometimes ſtand obliquely to it; by which means you make a very great variety of marks. When you have made this way of ſhooting very familiar to you, try it with about three quarters of a load at thirty yards; and by much practice of this method, you may become a better markſman at firſt going into the field than you would be without it by a year's practice in the field; becauſe you may hereby diſcover an error, that you perhaps would perſiſt in; and you can repeat your ſhoots at any time when you have leiſure, as often as you like; which is not the caſe in the field; for ſport is ſo very uncertain, that you may go out ſeveral times and not get many ſhoots; ſo that, unleſs a man be very alert, and ſtrong enough to undergo a deal of fatigue, he can attain the art of ſhooting flying but very ſlowly; whereas by this contrivance it becomes a ſcience, and may be practiſed with ſatisfaction by the curious, either weak or ſtrong. The reaſon why you are to uſe but half a load at firſt, is, that it may not in the leaſt diſturb your poſition, or cauſe you to ſtart; which if you ſhould get a habit of at firſt (as you may do by overloading) you will find it difficult to attain to any certainty: for you muſt be very ſteady, and endeavour to keep the gun to the mark after you have drawn the trigger, as has before been obſerved, and the ſhot will fly thick enough at twenty yards to make your obſervations from; and you may increaſe your load, and the diſtance you ſhoot at, by degrees, as you find it convenient: but never be covetous of overloading, though you want to kill at long diſtances, for that will not anſwer your expectation.

It may not be improper in this place to take notice of the force of powder. As there is an amazing difference in the ſtrength of powder, it is neceſſary that you try your powder, and increaſe or decreaſe its quantity, in proportion to its weakneſs or ſtrength. There are ſmall machines for this purpoſe, with a lock ſomething like a piſtol, which are convenient, as they are portable. But I lately contrived one, which ſeems to be much more ſatisfactory. I ſhall endeavour to deſcribe it to you, as follows. It was made of forged iron, one inch and three quarters ſquare, and two inches and a half long, with a ſhank about two inches long, on which part was filed a coarſe ſcrew, to fix it into a block by. A round ball was made of forged iron, about one inch and ſeven tenths diameter, and weighed twelve ounces. At the top of the iron was a hollow, made to receive about a third part of the ball, and fitting it very cloſe. In the middle of this hollow a hole was drill'd, about three tenths of an inch diameter, and one inch and a quarter deep, which held eighteen grains weight of powder; a place was ſunk on one of the edges of the ſquare for a pan, and a touch-hole drill'd. Thus compleated, it was ſcrew'd into a block, to point a little higher than an angle of forty five degrees, that the ball might lay the ſteadier in the hollow. After this I made the following experiments.

	Yards
Some Dutch powder, large grain'd, threw the ball - - - -	1 1-half
Some powder bought at the grocers, at 16d. per pound, near - -	4
Battle powder - - -	8 1-half
Double ſtrong ditto - -	8 1-half
Beſt double ſtrong ditto - -	12

The experiments were tried firſt with the ſtrong powder which increaſed at the ſecond trial about a yard and half, and third trial near a yard more. After which, the iron being a little warm'd, the trials with the ſame powder came pretty nearly alike, and each ſort was tried three or four times: the ball was alſo carried very nearly in the ſame line. From which circumſtance I conclude this the beſt method of proving gunpowder that I have yet met with.

If you have a deſire to be acquainted with the nature and compoſition of gunpowder, and the good and bad qualities attending it, I recommend to your peruſal the tracts on New Principles of Gunnery, by the late ingenious Benjamin Robins, Eſq; wherein, by a new contrivance, he has not only determined the force of any quantity of gunpowder, but alſo the velocities of balls diſcharged from barrels of ſeveral lengths, in a moſt accurate manner. He alſo makes it appear, that the incurvated track of balls to the right or left, or otherwiſe from the line, is occaſioned partly from the reſiſtance of the air on the inequalities of the ſurface, and partly from a whirling motion the bullet has acquired in coming out of the barrel. I think it is not unlikely, that the great difference of our ſhoots made with the ſame quantities of ſhot from the ſame piece may be from the ſame cauſes, as ſome of the ſhot are not very round, and ſome of them may acquire a greater degree of that whirling motion than others in parting from each other, which will continually increaſe the deflection as they go on from the line. If this be the caſe, we ſhould not endeavour to throw them with more force than is neceſſary; becauſe he proves, that the reſiſtance of the air will increaſe in a much greater proportion to the force added than has hitherto been ſuſpected, and will conſequently increaſe the deflection of thoſe ſhot which have received ſuch a motion. Upon the whole, therefore, I think, that if you uſe the beſt double ſtrong powder, two-thirds of the quantity will have as much force as the full charges of common powder; and be ſufficient to kill at fifty yards, which is as great a diſtance as a ſportſman will in general attempt to ſhoot at, and indeed greater than he ought to ſhoot at: for if we will make the lives of poor birds our diverſion, we ought to put them to as little miſery as we can; and therefore ſhould not ſhoot without being certain they are within our reach, ſo that the ſhot will fly thick enough to kill them outright. I therefore recommend it to you to begin with that quantity of the beſt powder, and not increaſe it, unleſs you find it neceſſary.

I have now given you all the hints I can recollect ſerviceable for the improvement of a young practitioner; but it muſt be from much exerciſe that you will become a markſman. As to your conduct in the field, you will have opportunities of going out with different perſons, who will differ much in their opinions: I ſhall therefore leave it to your own judgment to deal on every occaſion as experience may direct.

As you are going to leave this part of the country to-morrow, and the ſhooting ſeaſon is juſt at hand, I ſhall diſmiſs you with the following hints, always neceſſary to be remembered.

Take care to keep your powder from getting damp, which will weaken it in proportion to the quantity of moiſture it receives.

Before you take the field, examine that your barrel be clean and dry, and clear the touch-hole with a feather, which you may leave remaining in it until you load; and oil the ſprings of the lock.

Take with you flints, a turn-ſcrew, and a worm upon your rammer.

Load not 'till you are near the place of action. It will not be amiſs to fire off a little powder firſt, to warm the barrel; if you do not, it is neceſſary to put in a little more powder for the firſt load.

Prime not too full.

Ram down your powder very gently, with a ſingle wad of ſoft paper over it; and pretty tight, with a double wad over the ſhot.

When you have fired, load again as briſk as poſſible, before the barrel cools, as the heat will expel any dampneſs from the powder, and increaſe its force.

Be careful, yet not timorous.
Raiſe your piece gently to the object.
Take time, and never ſhoot without aim.
Be ſilent, and avoid the ſun.

APPENDIX.

APPENDIX.

HAVING in my firſt edition of Shooting Flying recommended to the curious the peruſal of the Tracts on New Principles of Gunnery, by the late ingenious Benjamin Robins, Eſq; it has been requeſted, that in my next edition I would ſelect from that work ſuch parts as may be thought uſeful to ſportſmen, in diſcovering the real velocities with which ſhot are thrown from barrels of different lengths and bores, with various charges of powder and ſhot. I ſhall, therefore, firſt give a ſhort account of the nature and properties of gunpowder; then proceed to give the rules for finding the potential or greateſt range of bullets, at forty-five degrees of elevation, of pieces of various lengths and bores, eſtimated in vacuo; from which will be ſhewn how much the velocity will be increas'd or decreas'd, by lengthening or ſhortening

tening the barrels: and then to elucidate the whole from experiments, as nearly as the nature of ſuch computations will admit: for a rigorous and geometrical determination is incompatible with the ſubject; it being almoſt impoſſible to make two experiments alike, without ſome variation, though near enough for our purpoſe to diſtinguiſh the goodneſs of guns uſed by ſportſmen, amongſt whom are ſuch frequent diſputes. And firſt of gunpowder.

Gunpowder is a compoſition of ſalt-petre, ſulphur, and charcoal. The ingredients are firſt to be finely powdered, then moiſtened with fair water, vinegar, ſpirit of wine or urine: and afterwards all muſt be well beaten for a long time, taking care to wet the maſs frequently to prevent its taking fire; and, laſtly, ſqueezing it through a ſieve to granulate it.

The charcoal and ſulphur eaſily take fire and kindle the nitre; and the ſpirit of nitre being thereby rarified into vapour, ruſhes out with an exploſion.

‘ The proportions of the ingredients of gun-
‘ powder are various; but that which has been
‘ approved by experiments, and ſeems now to
‘ be generally allow'd the beſt, is, that in any

‘ quantity of powder three-fourths of it ſhould ‘ be ſalt-petre, and the remaining one fourth ‘ conſiſting of equal quantities of ſulphur and ‘ charcoal. The moſt expenſive part of the ‘ compoſition, and conſequently the part in ‘ which powder is moſt liable to defect, is the ‘ ſalt-petre.’

‘ Salt-petre is of itſelf an uninflammable ſub‘ſtance: for if it be placed in the moſt violent ‘ fire, it only melts, and never flames, provided ‘ no combuſtible matter be previouſly blended ‘ with it. But though unmixed with other bodies ‘ it will neither flame nor burn, yet if it be ‘ joined with combuſtible ſubſtances, it greatly ‘ augments the violence of their burning: pow‘der then being a mixture of ſulphur and char‘coal (which are inflammable ſubſtances) with ‘ ſalt-petre (which in itſelf is not) if the ſalt-petre ‘ be too much in quantity, when compared ‘ with the other too, their burning may not be ‘ ſufficient to conſume the whole of the ſalt‘petre; whence the fire may be leſs violent. ‘ On the other hand, if the ſalt-petre be leſs ‘ than what the burning of the other two ſub‘ſtances can eaſily conſume, the fire will be ‘ leſs active and exploſive than it ought to be.’

‘ Hence it appears, that the goodneſs of pow‘der is not to be eſtimated from the quantity

‘ of ſalt-petre only contained therein; although ‘ that ſubſtance ſeems to be the baſis of the elaſtic fluid in which its force conſiſts. Nor is it ‘ the due proportion of the materials only which ‘ is neceſſary to the making of good powder: ‘ another circumſtance not leſs eſſential, is the ‘ mixing of them well together. If this be not ‘ effectually done, ſome parts of the compoſition ‘ will have too little force; and in either caſe ‘ there will be a diminution in the ſtrength of ‘ the powder.

‘ Gunpowder fired, exhibits by its exploſion ‘ the effects of an elaſtic fluid; whether it be ‘ air or not, I ſhall not take upon me here to ‘ determine; but this is certain, it acts like air ‘ in a condenſed ſtate. This fluid ſeems to be ‘ derived from the ſalt-petre alone; for neither ‘ the brimſtone nor charcoal yields it when ‘ fired ſeparately: and ſalt-petre is known to be ‘ a ſubſtance imbibed from the air by the earth; ‘ for the ſame parcel of earth, by being properly expoſed to the air, will furniſh ſalt-petre ‘ over and over again for ever.

‘ Now as bad powder uſually contains ſome ‘ common ſalt in it, by reaſon of the little care ‘ taken in refining the nitre; and as common ſalt ‘ imbibes moiſture in a ſtronger degree than nitre; it is not difficult to conceive how bad powder

‘ der ſhould in a moiſt ſeaſon be more impregnated with moiſture than good, and conſequently loſe more of its force.

‘ As powder when wet will not fire at all, ſo ‘ every degree of moiſture will leſſen its force. ‘ If therefore, powder be expoſed to the greateſt ‘ damps without any caution, or if common ſalt ‘ abound in it, the moiſture it imbibes may perhaps be ſufficient to diſſolve ſome parts of the ‘ nitre, which is a laſting damage that no dryneſs can retrieve; but if proper care be taken, ‘ in preſerving powder, and the nitre it is compoſed of have been well purged of the common ſalt, it will retain its force many years.

‘ But the moiſture of the atmoſphere will ‘ increaſe the weight of powder even in a room ‘ where a fire is kept; it is therefore neceſſary ‘ to dry the powder in damp weather before ‘ you uſe it. But ſome care is required in drying ‘ damp powder: for there is a degree of heat, ‘ which though not ſufficient to fire the powder, ‘ will yet melt the ſulphur, and deſtroy the ‘ texture of the grains: nay more, there is a heat ‘ with which the ſulpher will flame and burn ‘ away gradually, and yet the powder will not ‘ explode. Of this any one may ſatisfy himſelf ‘ by heating a plate of iron red hot, and then ‘ throwing on a few grains of powder at intervals

‘ vals during the time of its cooling: for by this ‘ means he will find, that at a certain time the ‘ ſeparate grains that fall on the iron will not ‘ explode, but will burn with a ſmall blue flame ‘ for ſome ſpace of time, the grains ſtill remain‘ing unconſumed.

‘ Standard gunpowder, ſuch as is or ought to ‘ be made for the uſe of the government, fired ‘ in any ſpace, acts nearly in the ſame manner ‘ as a quantity of air would do, which was a ‘ thouſand times more denſe than the common ‘ air we breathe; and which in that condenſed ‘ ſtate filled the ſame ſpace that was taken up ‘ by the unfired powder.

Hence it follows, that the preſſure of the powder on the ſhot grows perpetually weaker and weaker, as the ſhot are impelled forwards; the inflamed powder taking up more room, and conſequently its elaſticity being diminiſhed.

Mr. Robins diſcovered, ‘in a piece near four ‘ feet in length, charged with half an ounce of ‘ powder, and the ball about an ounce, that the ‘ velocity communicated to the bullet during the ‘ three firſt inches of its motion, was full half ‘ the velocity which it acquired in its whole paſ‘ſage through the barrel; and that the elaſti‘city or force of the powder in the firſt three ‘ inches of its expanſion, was at a medium near

‘ eight times greater than in the laſt two feet of ‘ the barrel; that from theſe circumſtances, the ‘ whole maſs of powder might be ſuppoſed to ‘ be kindled before the bullet was ſenſibly moved from its place.

‘ That if the charge of powder in a twenty-four pounder take up one foot of the cylinder ‘ before it is fired, and the whole length of the ‘ cylinder be nine feet, then when the bullet arrives at the mouth of the piece, the powder ‘ extends through nine times the ſpace it did ‘ at firſt, and conſequently exerts but one-ninth ‘ of its original preſſure; and the longer the ‘ piece be, in proportion to the extent of the ‘ charge, the more is the action of the powder ‘ diminiſhed.

‘ If the ſame piece be fired ſucceſſively with ‘ different charges of powder; the preſſure of ‘ theſe different charges upon the bullet, in any ‘ given part of the barrel, is nearly in propor- ‘ to the quantity in each charge.

‘ If two pieces of the ſame bore, but of different lengths, be charged with the ſame ‘ quantity of powder; the longer the piece, it ‘ will, ſtrictly ſpeaking, communicate the greater ‘ velocity to the bullet. However, unleſs their ‘ lengths be extremely diſproportioned, the ve-

‘ locities of their reſpective bullets will differ
‘ but little: for inſtance: if a muſket-barrel, of
‘ a common length and bore, be fired with a
‘ leaden bullet, and half its weight in powder,
‘ and if the ſame barrel be afterwards ſhortened
‘ by one half, and be again fired with the ſame
‘ charge; the velocity of the bullet in this ſhortened barrel will be about one-ſixth part leſs
‘ than what it was when the barrel was entire:
‘ and if, inſtead of ſhortening the barrel, it be
‘ increaſed to twice its cuſtomary length, (when
‘ it will be near eight feet long) the velocity of
‘ the bullet will be thereby augmented by more
‘ than one eighth part; and the greater the
‘ length of the piece be, in proportion to the
‘ diameter of the bullet, and the ſmaller the
‘ quantity of powder, the more inconſiderable
‘ will theſe alterations of velocity prove. So that
‘ increaſing or diminiſhing a twenty-four pounder, for inſtance, by a foot in length, with its
‘ cuſtomary charge of powder, occaſions no
‘ greater change than one-fortieth part in its
‘ velocity.

From the above-mentioned principles, the actual velocities, with which bullets are impelled from their reſpective pieces, are eaſily aſſigned; whence the potential random, or their greateſt ranges at 45 degrees eſtimated in vacuo, may be readily known.

I ſhall here lay down ſome practical rules for that end, without entering into their demonſtration.

RULE.

'If a leaden bullet be fired with its weight of 'powder from a piece of 90 diameters long; its 'potential random will be 60,000 yards: and if 'both the powder and the length of the piece 'be together increaſed or diminiſhed in any 'proportion; the potential random will be in'creaſed or diminiſhed in the ſame proportion. 'Thus with half of the weight of the bullet in 'powder, and a piece of 45 diameters long, the 'potential random will be 30,000 yards: and 'with a fourth of the weight of powder, and a 'piece of 22 one-half diameters, its potential 'random will be 15,000 yards.

'To find the potential random to any given 'piece, bullet and charge, proceed thus. Firſt 'find what length of piece, (eſtimated in dia'meters of the bullet) and what potential random 'correſponds in the preceding rule to the given 'charge of powder: call this potential random 'A: then if the length aſſigned by the rule be 'the ſame with the length of the given piece, 'this number A is obviouſly the potential ran'dom ſought. But if the length of the given 'piece be more than the length deduced from

‘ the rule; then take the difference of the tabu‘ lar logarithms of theſe two lengths, and mul‘ tiplying this difference into A (the logarithm ‘ of 10 being ſuppos’d unity) and then adding ‘ the reſulting product to A, the ſum will be the ‘ potential random required. If the given piece ‘ fall ſhort of the length deduced from the ‘ rule, inſtead of exceeding it; then the product ‘ of the difference of the logarithms into A muſt ‘ be taken from A, and the remainder will be ‘ the potential random ſought.’

Suppoſe it be required to determine the potential random of a piece thirty inches long, and ſix-tenths bore, carrying a bullet three quarters of an ounce weight*, equal to 328 grains, with 80 grains of powder; 80)328(4,1: here the weight of ball is four and one-tenth the weight of the powder; and by the rule 90 by 4, 1 is,

4,1)90,0(22 diameters

And 4,1)60000,0(14634 yards, which call A. Whence a piece of 22 diameters in length, with this charge, would have a random of about 14634 yards. The barrel in queſtion being 30 inches is 50 diameters, ſubſtract the logarithm of 22 from the logarithm of 50.

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* N. B. 438 grains weight, is equal to an ounce avoirdupoiſe.

The logarithm of 50 is 1,6989700
Logarithm of 22 is 1,3424227

0,3565473
The difference multiplied by A 14634

14261892
10696419
21392838
14261892
3565473

5217,7131882
To which add 14634

The potential 19851 random ſought.

	Inches.	Diameters.	Random.	
A piece of	36,	is 60	21010	Yards.
Ditto of	42,	is 70	21990	
Ditto of	48,	is 80	22838	
Ditto of	60,	is 100	24256	

Now let us ſuppoſe the killing diſtance of the piece of two feet ſix to be 40 yards: if we divide its random by 496, it will give that number 40: and if all the other randoms be divided by the ſame, their quotients will bear the ſame proportion.

Thus

		Diameters.	Yards.
Thus the barrel	2 feet 6	50	40
	3 feet	60	42,3
	3 feet 6	70	44,3
	4 feet	80	46
	5 feet	100	48,9

And theſe are the proportions of their killing diſtances, or velocities, from pieces of theſe lengths with the ſame bore and load. And barrels of any different ſized bores, with the ſame proportion of powder to the weight of the bullet, and the ſame lengths in diameters of the bullet, will have the ſame ranges.

Hence a piece of ſix-eighths bore will require a bullet of one-twelfth of a pound, equal to 584 grains; and 142 grains weight of powder, and 50 diameters, equal to 37 1-half inches, will be required to give the ſame range, or the ſame velocity, with the barrel of 30 inches in length, and ſix-tenths bore. So that of a piece of ſix-eighths bore, with the load mentioned, and 30 inches long, will be only 40 diameters, and the random would be 18433 yards, and its proportional killing diſtance only 37 yards: but as this load of powder is greater than any man can bear to ſtand againſt, with double the weight of the bullet in ſhot, its velocity will ſtill be much decreaſed by leſſening the quantity of powder: ſo that 90 grains weight of powder to the ball of 584 grains, with a piece of 40 diameters, would range only 13438 yards, its killing diſtance in proportion with the others being only 27 yards.

The following is the difference in the lengths of barrels of theſe two bores to give the ſame velocities, occaſioned by the difference of the diameters; with the due proportions of powder and ball to each ſize.

Diameters.		ſix-tenths bore,			ſix-eighths bore.	
50	of	2 feet	6	is	3 feet	1
60	-	3	0	-	3	9
70	-	3	6	-	4	4
80	-	4	0	-	5	0

Hence, pieces of any ſized bores muſt have ſo many diameters in length, and the ſame proportion of powder to the ſize of the ball, to give the ſame velocities.

In the former edition I endeavoured to prove, by comparing ſhoots made at ſeveral diſtances, that a barrel of a common length will not increaſe or decreaſe above a yard in diſtance for one inch of barrel, in regard to its carrying of the ſhot cloſer, &c. and by the above calculations it will not make above two yards difference in the velocity, for ſix inches of barrel; or (from the ſame) only 9 yards for twice the length of barrel, from two feet and a half to five feet.

From the preceding rules, the potential random of pieces of any lengths or bores may be found: but this on a ſuppoſition, that all barrels of the ſame lengths and bores, with the ſame charge, will throw a bullet with equal velocity.

Mr. Robins aſſerts, that he has had ſeveral barrels made for that purpoſe, of different metals and weights, yet of the ſame dimenſions of length and bore, and found no ſenſible difference in their range. However this may be with bullets; it is well known by experienced ſportſmen, that there are great differences in the velocities of ſhot thrown from barrels of the ſame lengths and bores. I ſhall, therefore, next point out the methods by which their real velocities may be known, and refer to ſome experiments ſufficient to determine the ſame.

The firſt method I ſhall propoſe for this purpoſe, is that contrived by Mr. Robins, for determining the real velocities of bullets, by firing them at a pendulum. Such a pendulum I made, according to the following eaſy and cheap conſtruction.

To a piece of flat iron, about a foot long, having a pivot at each end, I rivetted the end of a flat iron rod, about fifty-four inches in length, ſo as to form a T. At the bottom of the rod were three holes, about three inches from each other, to which was faſtened, by three ſtrong wood ſcrews, a piece of plank-wood about fourteen inches ſquare, and two inches and a half thick. I then hung it upon two half-ſtaples to a joiſt of the cieling of an out-houſe, oppoſite the door, ſo that it might be eaſily taken off and on as I wanted it, and ſwing to and from the door ſpace ſo freely on its pivots, as to be eaſily put in motion; the pivots being greas'd or oil'd, to prevent any extra-friction of the ſtaples cutting the pivots: I then fixed a ſmall iron rod from the lower part of the wood or pendulum, to reach within about four inches of the floor, with a loop hole at its end, to faſten a ribbon or tape to. At a little diſtance before it, was laid looſe on the floor a piece of wood, heavy enough to reſiſt a ſmall force, to which was fixed a piece of ſimple contrivance, through which the tape might be drawn eaſy, but yet ſtiff enough to meaſure the extent of the vibration, after a blow given to the pendulum; one end of the ribbon being faſtened to the loop-hole of the rod. The little inſtrument for drawing the ribbon through was thus made. I took a piece of thin plate braſs, about the ſize of a card, bent down ſquare about three quarters of an inch of its breadth, through which two holes were made, to faſten it by two ſmall wood ſcrews to the piece of wood mentioned; the other edge was bent down ſquare the contrary way for about half an inch of it, and cloſe to the part bent down, near one end of it, was a hole as long as the breadth of the ribbon, and a thin ſpring of braſs riveted to the other end of the part, bent down, ſomething longer than the whole, in order to preſs it down by the finger, whilſt I put the ribbon through which was to draw tight betwixt the ſpring and the upper part. The machine thus compleated, and faſtened to the piece of wood, and laid about twelve inches before the rod of the pendulum (to which was faſtened the ribbon) and drawn tight through the machine, and laid looſe on the floor, I put a pin through the ribbon, cloſe to the edge of the braſs next the pendulum; and fixed a reſt, to lodge the muzzle of the gun upon, at ſeven yards diſtance, in order to make every trial at the ſame diſtance, as well as to level it exactly at the center.

When I made the firſt experiment, I found the wood was too hard, as ſome of the ſhot rebounded from it: I therefore cover'd it with a piece of poplar plank, faſtened to the wood of the pendulum by a nail at each corner: which I found very convenient, as I could eaſily take it off after ſhooting many times at it, and fix on another piece; becauſe by often ſhooting at it, the pendulum will become heavier; which would cauſe ſome difference in the experiments, unleſs allow'd for.

The firſt of the following experiments I made to try the difference of the force of powder, from a piece of two feet ten inches the barrel, the bore five-eighths: weight of the whole gun five pound four ounces; with eighty grains of powder, and one ounce and a half of ſhot.

No. 1.

	Inches.
Te beſt double ſtrong powder drew the ribbon out - - -	18. 1-half.
Ditto - - - -	19 1-half.
Powder bought at 16*d.* per pound,	12 1-half.
Ditto bought at 20*d.* - -	16 1-half.

No. 2. The ſame charge with a piece three feet three inches the length of the barrel, and ſix-tenths the bore: weight of the whole gun five pounds twelve ounces.

	Inches
The beſt double ſtrong powder drew the ribbon out - - -	27 1-half.
Ditto - - - -	28 1-half.
Powder at 16*d.* per pound -	18
Ditto at 20*d.* - - -	20

The trials made with the firſt gun were weaker, I believe, on account of the touch-hole being wider than uſual: but the proportions are much the ſame, and agree nearly to the proportions in thoſe experiments made in the former part with my powder-trier: I ſay nearly; for exactneſs is incompatible with experiments of this kind.

No. 3. A gun two feet ſix inches the length of barrel, and ſix tenths bore; weight of the whole gun five pounds ſix ounces.

	Inch.
With eighty grains weight of powder, and one ounce and a half of ſhot, drew the ribbon out - -	24
Ditto - - - - - -	25
Ditto with two ounces of ſhot - -	27
Ditto with ninety-two grains of powder, and two ounces of ſhot - -	30

No. 4. Another gun two feet ſix inches the length of barrel, and five-eighths bore; weight of the whole gun five pounds eight ounces.

	Inches.
With eighty grains weight of powder, and one ounce and a half of ſhot drew the ribbon out	25 1-half.
Ditto with two ounces of ſhot	28
Ditto with ninety-two grains of powder, and two ounces of ſhot	30 1-half.

	Inches.
The gun, No. 2. with eighty grains of powder, and one ounce and a half of ſhot, drew out	25 1-half.
Ditto with two ounces of ſhot	29
Ditto with ninety-two grains of powder, and two ounces of ſhot	31

Here it ſhould be remarked, that though the ribbon was drawn out farther with two ounces of ſhot than with one ounce and a half, and 80 grains weight of powder; yet as there was a fourth part more weight in the two ounces, ſo one fourth part of the inches meaſured on the ribbon ſhould firſt be taken off, and then by comparing, it will be found; that each ſingle ſhot of the ounce and a half charge, had the greateſt velocity: the quantity of powder muſt therefore be increaſed in proportion to the addition of ſhot, to give each ſhot in the different charges the ſame velocity.

The number of inches drawn out and meaſured on the ribbon, will, I apprehend, be thought ſufficient, by the greater part of my readers, for diſcovering the velocities that ſhot are thrown with from different guns, by comparing them with each other, or the force of different powders by the ſame compariſons. But if we be further curious to know the actual velocity given by the exploſion of powder, that is, how many feet in a ſecond the ſhot fly at firſt coming from the barrel; this requires a farther inveſtigation, which I ſhall endeavour to explain in the moſt eaſy method.

‘ The principle on which the machine here ‘ deſcribed is founded, is this ſimple axiom of ‘ mechanics; that if a body in motion ſtrike ‘ another at reſt, and they be not ſeparated after ‘ the ſtroke, but move with one common motion; ‘ then the common motion is equal to the motion ‘ with which the firſt body moved before the ‘ ſtroke: whence, if that common motion, and ‘ the maſſes of the two bodies be known, the ‘ motion of the firſt body before the ſtroke is ‘ thence determined. Hence then, if the weight ‘ of the pendulum be known, and likewiſe the ‘ reſpective diſtances of its center of gravity, ‘ and center of oſcillation, from its axis of ſuſ‘ penſion; it will thence be known what motion ‘ will be communicated to this pendulum by ‘ the percuſſion of the body of a known weight ‘ moving with a known degree of celerity, and ‘ ſtriking it at a given point. And hence, if ‘ a bullet or charge of ſhot of a known weight ‘ ſtrike the pendulum, and the vibration which ‘ the pendulum makes in conſequence of the ‘ ſtroke be aſcertained, the velocity with which ‘ the ball or ſhot moved is thence to be known.

‘But in order to compute the velocity from ‘the vibration of the pendulum after the ſtroke, ‘it is firſt neceſſary to know the dimenſions of ‘the pendulum.

The weight of this whole pendulum was 32 pounds 1-half: its center of gravity was 42 inches diſtant from its axis of ſuſpenſion: and 55 of its ſmall ſwings were performed in a minute; whence its center of oſcillation (determined from hence) is 46 inches and near 3-4ths diſtant from that axis. The center of the piece of wood is diſtant from the ſame axis 49 inches: and to the loop where the ribbon is faſtened is 96 inches from the ſame axis.

To find the center of oſcillation, ſay, as the ſquare of the vibrations is to the ſquare of 60 (the vibrations in a minute) ſo is the length of a pendulum which beats ſeconds (viz. 39. 2 inches) to the diſtance of the center of oſcillation from the axis of ſuſpenſion. Thus 3025 is to 3600 ſo is 39,2 to 46 3-4ths, the diſtance required.

‘In a compound ratio of 49 to 46 3-4ths, ‘and 49 to 42, take the quantity of matter of ‘the pendulum, 32 1-half, and the fourth ‘number will be 26 pounds nine ounces.’ Thus as 49 multiplied by 49 is to 46,75 multiplied by

42 ſo is 32,5 to 26 pounds 9 ounces, the anſwer required.

‘ Now geometers well know, that if the blow ‘ be ſtruck in the center of the piece of wood, ‘ the pendulum will reſiſt to the ſtroke in the ‘ ſame manner as if this laſt quantity of matter, ‘ 26 lb. 9 oz. were concentrated in that point, ‘ and the reſt of the pendulum taken away. ‘ Whence (ſuppoſing the charge of ſhot impinging round that point to be two ounces, or ‘ nearly 1-212th part of this quantity of matter) ‘ the velocity of the point of oſcillation after ‘ the ſtroke (by the laws obſerved in the congreſs of ſuch bodies as rebound not from ‘ each other) will be 1-212th of the velocity ‘ the body of the ſhot moved with before the ‘ ſtroke.’

‘ The velocity of the point of oſcillation after the ſtroke is eaſily deduced from the chord ‘ of the arch, through which it aſcends by the ‘ blow: for it is a well known propoſition, that ‘ all pendulous bodies aſcend to the ſame height ‘ by their vibratory motion, as they would do, ‘ if they were projected directly upwards from ‘ their loweſt point, with the ſame velocity they ‘ have in that point. Wherefore if the verſed ‘ ſine of the aſcending arch be found (which is ‘ eaſily determined from the chord and radius

‘ being given) this verſed ſine is the perpendi‘cular height, to which a body projected up‘wards with the velocity of the point of oſcil‘lation would ariſe: and conſequently, what ‘that velocity is, can be eaſily computed by ‘the common theory of falling bodies. For ‘inſtance; the chord of the arch deſcribed by ‘the aſcent of the pendulum after the ſtroke, ‘meaſured on the ribbon, has been ſometimes ‘28 inches; the diſtance of the ribbon from ‘the axis of ſuſpenſion is 96 inches.’ Then proceed from 28 in the ratio of 96 to 49. Thus, as 96 is to 49 ſo is 28 to 14 1-3d, the chord of the arch through which the center of the board aſcended after the ſtroke. Now to find the verſed ſine of an arch, whoſe chord is 14 1-3d, and radius 49, ſay, as 98 (the duplicate of the radius) is to 14 1-3d ſo is 14 1-3d to 2,2.

Now the velocities acquired by falling bodies are as the ſquare roots of the heights fallen from: and as a body falls by its gravity 16 feet 1-12th in one ſecond, and acquires a velocity to carry it uniformly through 32 feet 1-6th, or double the former ſpace in a ſecond; we have, as the ſquare root of 16 1-12th, or the ſquare root of 193 inches, is to 32 1-6th; that is, as 13,9 is to 32 1-6th, ſo is 1,49 to near 3 feet in a ſecond, the velocity which would carry a body to this height; or, which is the ſame thing, the velocity which a body would acquire by deſcending thro' this ſpace.

'To determine then the velocity, no more 'is neceſſary than to multiply 3 by 212, and 'the reſulting number, 636, will be the feet 'the charge of ſhot would deſcribe in a ſecond, 'if it moved with the velocity it had at the 'moment of its percuſſion. But this velocity 'is to be increaſed in the duplicate ratio of the 'diſtance of the points of oſcillation and per'cuſſion from the axis of ſuſpenſion. That is 'to ſay, as the ſquare of the oſcillation-diſtance 'is to the ſquare of the percuſſion-diſtance, ſo 'is the velocity here found to the true velocity.' Thus, as 2186 is to 2401 ſo is 636 to 695 feet in a ſecond, the actual velocity.

'And ſince the length of the ribbon drawn 'is always nearly the chord of the arch de'ſcribed by the aſcent, and theſe chords are 'known to be in the proportion of the veloci'ties of the pendulum acquired from the ſtroke; 'it follows, that the proportion between the 'lengths of ribbon drawn out at different times, 'will be the ſame with that of the velocities of 'the impinging ſhot; and conſequently, by the 'proportion of theſe lengths of ribbon to 28, 'the proportion of the velocity with which the 'ſhot impinge, to the known velocity of 695 'feet in a ſecond, will be determined.' Suppoſe it be requir'd to find how many feet in a ſecond the ſhot inpinged with to draw the ribbon out 20 inches: ſay, as 28 is to 695 ſo is 20 to 460 feet, the anſwer.

Whilſt I was making the experiments at the pendulum, it came into my mind, that the proportionate velocities with which ſhot be thrown from guns of different lengths and bores, might be diſcovered by ſhooting at a maſs of ſtiff-tempered clay, at ſuch a diſtance, that a ſufficient number of the ſhot might be thrown into the maſs, to take a medium of the depths they were ſunk into the clay. I therefore formed a cube of clay, cleared from ſtone, and well b aten, as ſtiff as poſſible to be found; this hav ing ſix ſides, afforded opportunity for ſix ſhoots, either from different guns or with different charges: from which I made the following experiments.

Some experiments made to try the velocity or force of ſhot, by firing at a maſs of ſtiff-tempered clay at thirty-five yards diſtance.

No. 3. A gun two feet ſix inches the barrel; the weight of the whole gun five pounds ſix ounces; the bore ſix-tenths diameter.

Powder.	*Shot.*		*Sunk deep.*	
Grains	Oz.	qrs.	Inch.	eighths.
80	1	1	1	3
—	1	2	1	2
—	2	0	1	0
—	2	2	0	7
—	2	0	1	1

No. 5. A Spaniſh barrel three feet five inches; weight of the whole gun was ſix pounds; and ſix-tenths of an inch bore.

Powder.	*Shot.*		*Sunk deep.*	
Grains.	Oz.	qrs.	Inch.	eighths.
80	1	1	1	2
—	1	2	1	2
—	2	0	1	2
—	2	2	1	1
—	2	0	1	1 1-half

The depth of the ſhot-holes made in the clay in the above experiments was taken as nearly as I could at a medium: for they were not all of a depth at each ſhoot: which I attributed partly to the inequalities of the ſhot, though of the ſame number, and partly to ſome ſmall ſtones that might be left in the clay, though it had been well picked and tempered. I therefore cut the clay into thin ſlices, dried it, beat it in a mortar, and ſifted it, then wrought it again into a maſs which was well beaten, and formed a cube of about ſix inches diameter. This maſs was not ſo ſtiff as the laſt; which I ordered purpoſely that the ſhot might ſink farther into it. The experiments made with it were as follow. The wad uſed in theſe experiments was ſtamped out of liſt.

No. 4. The gun two feet ſix inches the barrel, ſix-tenths bore, and weight of the whole gun five pounds eight ounces, being opened a little towards the breech.

Powder.	*Shot.*			*Sunk deep.*	
Grains.	Oz.	qrs.		Inch.	eighths.
80	1	1		2	3
—	1	2		2	2
—	2	0		2	0
—	2	2		1	6
—	2	0	paper wad	2	0

No. 6. A gun three feet five inches the barrel; 5-8ths bore; weight ſeven pounds and one quarter.

Powder.	*Shot.*			*Sunk deep.*	
Grains.	Oz.	qrs.		Inch.	eighths.
80	1	1		1	7
—	1	2		1	7
—	2	0		1	6
—	2	2		1	6
—	2	0	paper wad	1	2

Though in theſe experiments the ſhot were ſunk deeper into the clay than in the former; the depth was not more regular; ſo that I prefer clay that is temper'd as ſtiff as is compatible with making a ſound maſs of it.

I order'd another maſs of clay to be temper'd very ſtiff, to try two guns at of a larger bore; but firſt made one ſhoot with the gun, No. 3. by way of ſtandard to refer to.

	Inch.
The gun, No. 3. with 80 grains of powder, and two ounces of ſhot, at 35 yards, ſunk into the clay -	1 1-4th.
One, No. 7. the barrel two feet ſeven inches, and 6-8ths bore, with the ſame load; weight of the gun ſix pounds - - - -	1
Ditto with 92 grains of powder, and two ounces and a half of ſhot -	1
A gun, No. 8. the barrel three feet ſix inches, and 6-8ths bore; weight of the whole gun ſix pounds twelve ounces, with 80 grains of powder, and two ounces of ſhot - -	1 1-4th.
Ditto with 92 grains of powder, and two ounces and a half of ſhot -	1 1-8th.

In the experiments made with the guns two feet ſix and three feet five inches at the firſt maſs of clay, there appears to be no difference in their velocities, tho' the barrels were of the ſame bores. I therefore conclude the ſmall barrel to be the beſt.

In the experiments made at the ſecond maſs of clay, the barrel three feet five inches being the largeſt bore, to try it fairly, it ought to have had a greater load; for the ſhoots from that of two feet ſix inches are greatly ſuperior.

From the experiments made at the third maſs of clay, that a barrel two feet ſeven, ſix-eighths bore, did not throw the ſhot with ſo much force by one fifth part with the ſame load; and that when half an ounce of ſhot was added to the charge, it required twelve grains weight of powder, to give the ſame velocity the ſhot had from the former charge.

That the barrel three feet ſix inches, and ſix-eighths bore, threw the ſhot with only the ſame velocity as the barrel two feet ſix inches, and ſix-tenths bore. So that there appears to be no other advantage in ſhooting with theſe larger bored barrels, than their carrying a larger load. Whereas, 92 grains weight of powder and two ounces and a half of ſhot, ſeems to be as much as any man will care to ſtand

I could with pleaſure have made more experiments, both at the pendulum and clay: but my health at this time could not permit it. However, as the method for both are here fully given, every one may ſatisfy himſelf with as great a variety of experiments as he pleaſes: and I doubt not but it will afford more pleaſure to thoſe who have leiſure, than many other trifling diverſions, in which men often waſte their time.

As the conſideration of the reſiſtance of the air is of the greateſt importance to the perfection of gunnery; I think it would be a culpable omiſſion not to ſay any thing on that head, tho' of no great conſequence in ſhooting flying; becauſe few perſons will uſe ſo large a quantity of powder in proportion to the charge of ſhot, as to have it retard inſtead of increaſing their velocities.

Mr. Robins, from computations confirmed by ſucceeding experiments, makes it appear, 'that a leaden ball of 3-4ths of an inch diameter, and weighing nearly 1-3d oz. avoirdupoize, if it be fired from a barrel of 45 'inches in length, with half its weight of powder, will iſſue from that piece with a velocity, 'which if it were uniformly continued, would 'carry it near 1690 feet in one ſecond: and

‘ that the reſiſtance of the air on a bullet firſt
‘ moving with that velocity amounted to 10
‘ pounds, which is 27 times its own weight.
‘ That an iron bullet weighing 24 pounds, if
‘ fired with 16 pounds of powder (which is
‘ uſually eſteemed its battering charge) ac-
‘ quires a velocity of about 1650 feet in a
‘ ſecond, ſcarcely differing from the other.
‘ Whence, as the ſurface of this laſt bullet is
‘ more than fifty-four times greater than the
‘ ſurface of a bullet of 3-4ths of an inch in
‘ diameter, and their velocities are nearly the
‘ ſame; it follows, that the reſiſtance on the
‘ larger bullet will amount to more than 540
‘ pounds; which is near twenty three times its
‘ own weight. And if the charge of powder
‘ be increaſed, the reſiſtance of the air will be
‘ increaſed; conſequently, though increaſing
‘ the charge of powder will increaſe the velo-
‘ city of the ſhot, ’till the powder arrive at a
‘ certain quantity; yet after this if the powder
‘ be increaſed, the velocity of the ſhot will
‘ decreaſe.’

The ſhot generally made uſe of by ſportſmen for ſhooting flying, are No. 3. No. 4. No. 5. and No. 6. and are in the proportion of 300, 400, 500, and 600, in every two ounces of ſhot of each number; which is a very proper load for a birding-gun of a middle-ſized bore. Now the ſmalleſt of theſe numbers are made uſe of by ſome, on account of their flying thicker, and thereby having the greater chance of diſabling the wing. But as birds are ſo frequently loſt when only winged; and if only three ſhot take place in the body of the bird, it will be more certain of killing the bird than ſix of the ſmaller ones; I believe the advantage will be in thoſe of the larger ſize: but No. 4. will do very well 'till Michaelmas for partridge-ſhooting; after which time No. 3. I ſhould think the beſt: becauſe birds will then fly ſtronger, and are not ſo eaſily brought down with thoſe of No. 4.

The proportions of the ſurface of a ſingle ſhot of each of theſe numbers are nearly,

As	7,3681	6,0822	5,2415 and	4,6415
Which multiply'd by	300	400	500	600
Give	22,1043	24,3288	26,2075	27,8490

the proportions of the reſiſtance upon the charge of two ounces: for theſe laſt numbers expreſs not the abſolute quantities of the ſurfaces, but the proportionate quantities of ſurface of 3, 4, 5, and 6 hundred ſhot to each other. By comparing which it appears, that there is ſo great a difference as 1-4th of ſurface more on the charge of No. 6. than there is on the ſame charge of No. 3: conſequently the reſiſtance of the air is ſo much greater on No. 6: and as there is but half the quantity of matter in each ſhot, their velocity is not half ſo great as thoſe of No. 3: which muſt, I think, be ſufficiently clear to thoſe who conſider it.

It is well worth while for any perſon to ſatisfy himſelf by making ſeveral ſhoots from the ſame gun, at a cube of clay at different diſtances, as 20, 30, or 40 yards, with a proper load of powder and ſhot of No. 3: and then repeat the ſame trials at the other three ſides of the clay, with the ſame gun and load at the ſame diſtances, but with ſhot of No. 6: taking the medium of the depth of the ſhot-holes from each ſhoot: or he may make the like experiments with ſhot of other ſizes, and at any diſtances he like, by comparing of which he will be able to determine what ſort of ſhot will beſt ſuit his purpoſe.

The reſiſtance of water is 850 times greater than that of air: and by encreaſing the velocity, it will ſometimes reſiſt as much as a ſolid. I ſhall give the following remarkable experiment, mentioned by Dr. Deſaguliers, to confirm this aſſertion. A ſail was ſpread horizontally in a pond, about two feet and a half under

der the ſurface of the water; and a muſket with a ſmall charge being fir'd obliquely to the ſurface of the water, but perpendicularly to an half-inch deal board fixed under the water over the ſail; the bullet went through the board under the water, and after that through the ſail-cloth. The experiment was made again with a greater charge; and the bullet ſtruck againſt the board, without going through it, making but a ſmall impreſſion in the board; yet its roundneſs was alter'd more than the reſiſtance of the board ſeem'd likely to have cauſed; and therefore the bruiſe in the ball was thought owing to the reſiſtance of the water. Upon increaſing the charge a third time, the ball fell upon the ſail, without reaching the board, and was much beaten out of ſhape. At laſt, putting in a charge nearly equal to the proof, (that is, the weight of powder equal to the weight of the bullet) the bullet was beaten to pieces upon the ſurface of the water.

This great reſiſtance of water was further confirmed by an accident which happened in firing off ſome water-rockets (upon the Thames) whoſe property is to go under ſeveral times, and riſe again, and at laſt burſt above the water. One of them in its laſt riſe ſtopping under the middle of a barge, broke there, and made ſo great a hole in the barge's bottom, that there was only time for the company to ſhift into another barge which was near, and the water-man to row aſhore from the middle of the Thames (at Mortlake, where it is but narrow) before the barge was half full of water. Here the water reſiſted like a ſolid; and conſequently the powder made its way thro' the wood, which was leſs denſe, and not very thick.

AN ADDITIONAL
APPENDIX
CONCERNING
DOGS.

THE perfection of a Dog depends not only on the beauty of his form, his ſtrength and agility, but on his interior qualities: When the latter be improved by proper training and inſtruction, he becomes an uſeful companion to man, to aſſiſt in his deſigns, to watch his ſafety and defend him. A motion of the hand, or even of the Eye is ſufficient to make him underſtand the will of his maſter, which he inſtantly purſues with eagerneſs, courage and fidelity.

It is not my intention to write a hiſtory of Dogs; nor can it be expected one could be given in a few pages: My preſent deſign then is only to give a deſcription of ſuch Dogs as are moſt ſerviceable for a ſportſman to ſhoot with, and to point out the method which experience has taught, and is approved of by all able ſportſmen, for training, breaking, and managing them. And as my art of Shooting Flying has been fortunate enough to meet with a general approbation, I have added this additional Appendix to render that treatiſe as uſeful as poſſible to thoſe who delight in that diverſion.

And firſt of **POINTERS.**

Section I.

AS nothing has yet been publiſhed on theſe Dogs (at leaſt that I have met with;) I am inclined to think that they were originally brought from other countries, tho' now very common in England: Their great utility and excellence in ſhooting Partridges, moor or heath-Game, which make them worthy our regard, are well known. There is ſo great a variety of Pointers of different *make* and *ſize*, and *ſome* good of each kind; that it is no wonder men ſhould differ in their opinions concerning them. The Pointers I beſt approve, are not ſmall, nor very large; but ſuch as are well made, light and ſtrong, and will *naturally* ſtand. A ſmall Pointer, tho' ever ſo good in his kind, can be but of little ſervice in hunting, particularly thro' a ſtrong piece of turnips, broom or heath; and the feet of a large heavy Dog, will ſoon be tired by his own weight. 'Tis proper for a young ſportſman to purchaſe a Dog that is well broken, and to enquire the method and words he has been uſed to by his former maſter in *breaking and hunting with him*: Otherwiſe the Dog will have a new leſſon to learn, which will be a great diſadvantage both to him and his maſter. But if a young ſportſman is deſirous of breaking his own Dogs, the following is the method I would adviſe.

Having made choice of a whelp of a known good breed, begin when about three or four months old *to teach him* to couch at a piece of bread, cauſing him to lie, whilſt you walk round him at ſome diſtance, and come nearer to him by degrees: When he has lain as long as you think proper, reward him with the piece of bread and *ſpeak kindly to him.* Teach him to fetch and carry, to bring a glove or a bird of any ſort after you; always obſerving to cheer him with kind expreſſions when he does well, and check or ſpeak roughly *to him* when he does not obey. Uſe him to obey by whiſtle and ſigns with your hand as much as poſſible; for it is a bad way to make more hallooing in the field than is neceſſary. When you chaſtiſe *him,* it ſhould be with a whip, ſo as to make him remember it, uſing a rough voice at the ſame time; but the chaſtiſement ſhould not be too ſevere, and the words you uſe to him as few as poſſible; ſince he may be ſuppoſed better to underſtand the ſound than the language. When he is about five months old, uſe him frequently to be tied up, let him off his chain for half an hour or an hour morning and evening. It is beſt to give him his leſſons in a morning before you feed him, this ſhould be done chiefly with your own hand, that it may ſeem as a reward, the more to endear you to him; but do not overfeed him. Take him out whenever you walk, ſometimes leading him in a ſtring; ſuffer him to go a little before you, and ſometimes behind; but when looſe never ſuffer him to go far from you, unleſs you hunt with him; and oblige him to come to you at the word *back*, or *here*; train him thus by continual leſſons, till his attention is always on you to know what he is to do. It will not be amiſs frequently to fire off a little powder, and to make him lie down whilſt you load again, which will not only teach him to ſtand fire (for many Dogs will at firſt quit the field on the diſcharge of a gun) but will alſo make him acquainted with this very neceſſary part of his buſineſs in the field; from the neglect of which he would frequently ſpring birds whilſt you are loading. At ſix, ſeven, or eight months old (for all Dogs will not begin to hunt alike early) take him into the field in pairing time, or the latter end of Auguſt; and if you have an old ſtaunch Pointer, take him with you at firſt to teach or rather encourage the other to hunt off. When your old Dog makes a point, if the young one be not near, bring him up by degrees 'till he ſpring the birds, and let him enjoy the ſcent; which will encourage him to hunt. When you find he knows birds, and will hunt, it is beſt to take him out alone: obſerve which way the wind lies, and if you can conveniently, enter on that ſide of the piece you intend to hunt in, which is oppoſite the wind, and do not ſuffer your Dog to go in before you, caſt him off to the right or left croſs before the wind, walking ſlowly the ſame way till he be got to the ſide of the piece, then whiſtle or give the word *back*, at the ſame time walking the contrary way, pointing with your hand the way you would have him go; bring him back till he come to the other hedge or ſide of the field, advancing forward ten or twelve yards, every time he croſſes you; repeat this 'till you have regularly hunted thro' the whole field; by which means you will certainly find birds if there be any. When he point, walk up to him, and go forward ſlowly towards the birds, when you think you are within a few yards of them, if they lie and your dog be ſteady, walk in a circle round them, coming nearer by degrees 'till you ſpring the birds. If your Dog run after them (as moſt young Dogs will do) check him with rough words; but if he continue doing ſo you muſt chaſtiſe him ſmartly with your whip 'till you break him of that fault. It is very common with young Dogs that will ſtand at firſt, afterward, to break in and ſpring the birds; which you muſt never indulge him in. Put a few ſmall ſtones in your pocket, and when he ſtand, endeavour to head him, that is, to get before him, holding up your hand with a ſtone ready to throw at him, to deter him from ſpringing the birds, whilſt you can walk round him; or if it be convenient, take a perſon with you on horſeback, and when your Dog commits a fault, or does not obey your call or whiſtle; let him ride after and whip him; and at the ſame time, if you whiſtle or call, he will naturally come to you for protection. Thus he will learn to come to you, as he always ſhould do, when he has committed a fault; for if he was puniſhed ſeverely by yourſelf, you would find he would not come near you when he knew he had done wrong; which would render it difficult to break him: but if this method be obſerved; by harſh words and moderate correction he will ſoon get the better of the foible and become ſtaunch. When he

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commits a fault, command your temper in correcting him, and let it be without paſſion, and let no fault provoke you to kick or ſtrike ſo as to hurt him. I have ſeen an irrecoverable miſchief done from a kick, when the laſh of the whip would have had a better effect.

The breed of Pointers which has been mixed with Engliſh Spaniels, ſuch as are for Setting-Dogs, (in order to have ſuch as will run faſt and hunt briſkly) are according to the degree of Spaniel in them, difficult to be made ſtaunch, and many of them never will ſtand well in company. The method already given is the moſt likely to ſucceed with theſe (but I would by no means adviſe a young ſportſman to meddle with ſuch.) If you find your Dog refractory, and cannot eaſily make him ſtand, yet find ſome qualities that induce you to take a good deal of trouble with him (ſuch as a very extraordinary ſagacity in ſcent and that of a ſtrong bold hunter) when he knows birds well you may hunt him with a leather ſtrap three or four yards long, faſtned to his collar, which by his treading on it frequently will ſhorten his ſpeed, and render him the eaſier to be ſtopped. Some will hunt him with a collar lined with another, through which ſeveral clout-headed nails are put, the points inward, and a line faſtened thereto: which will not only check his running too faſt, but when he ſtops, if the line be long enough for you to get ſo near as to ſet your foot on or take hold of it, if he bolts forward he will be pricked ſo as to make him remember it, and will endeavour to avoid the repetition of that puniſhment. You muſt be very ſtrict with him, and not hunt him in company with any other Dog, 'till he be quite ſtaunch: it often coſts a great deal of trouble to make him ſo; but ſuch Dogs when broken, do often turn out the beſt.

Some are of opinion that the way to make Pointers ſtand well in company is, when they are young, to take them out conſtantly with your old ſtaunch Dogs, and they will learn by degrees to ſtand both with or without company. But unleſs he is of a breed known to ſtand naturally, you will find more difficulty in breaking a vicious Dog in company than by himſelf.

It is alſo common, not to begin to enter Pointers till near a year old; becauſe uſing them very young ſhortens their ſpeed. Suppoſe there is truth in this maxim, and your Dog ſhould not hunt altogether ſo faſt, a ſufficient

cient amends will be made for his want of ſwiftneſs, by hunting more carefully, *nor will he run* upon birds or paſs them unnotic'd as Dogs which *run very faſt* are apt to do.

One good Pointer in the field at a time, if you have patience to attend to him, will be ſufficient for two men to ſhoot from; but if you have an old ſpringing Spaniel, that is *ſo well* under command that *you* can always keep *him* near you; ſuch a Dog may be uſed with your Pointer with great advantage: as he will better find birds that are wounded, and alſo ſpring ſuch as are near you, which you otherwiſe might paſs. But if you ſhould be fond of hunting many pointers together in a field, as is frequently done; you ſhould not have more than one amongſt them, who has been taught to fetch his game: leſt by endeavouring to get it from each other, they ſhould tear it.

Two perſons in the field with guns are better than more at Partridge-Shooting; who ſhould with patience pay a due attention to each other. When your Dog points, walk up without any hurry, ſeparating a few yards one to the right and the other to the left of your Dog: If a covey ſprings never ſhoot into the midſt of them, but let him on the left ſingle out a bird which flieth to the left, and him on the right a bird to the right, that you may not interrupt each other, nor both ſhoot at the ſame bird, "and readily let fly at the firſt aim." Let each of you mark the fall of his bird, and immediately run to the place; and if the Dog does not ſecure it, or the bird ſhould be only wounded and have run, put him upon the ſcent; but if your Dog underſtand his buſineſs, and will fetch his game, it it better to truſt to him and load again as quick as you can. It will always be of great uſe and ſave much time and trouble, to have a perſon without a gun to mark the flight of the birds.

If a ſingle bird be ſprung, let him take the ſhoot to whoſe ſide it flies: the bird being killed, cauſe your Dog to lay by it whilſt you load, leſt he ſpring other birds that are near you.

If you trace the birds to a hedge, double the row by walking one on each ſide, taking your Dog on the ditch ſide: here if you have a Spaniel he will be of great uſe; as you may make him go along in the ditch, and your Pointer on the other ſide; by which means you will not paſs a bird, and one of you will moſt likely get a good ſhoot at it. Your own judgement, with very little experience will beſt direct where the birds are moſt likely to be found at different times of the day, according to the grounds you have to hunt in.

Of PHEASANT and WOODCOCK ſhooting.

Pheaſants or woodcocks generally lay in carrs or woods where there is much cover. Spaniels are therefore the dogs moſt proper for this kind of ſhooting. Some pointers indeed, that are bold ſpirited and have been a great deal uſed to this work, will follow a pheaſant very well; but from the generality of ſlow ſtaunch pointers a pheaſant will get off ſo faſt, as when ſprung to be out of the reach of gun-ſhot; beſides they are not hardy enough to go into thick cover.

The ſpaniels proper for this work are of a middling ſize, their legs rather ſhort and very ſtrong: they muſt be hardy, able to bear great fatigue, diſpoſed to go into cover freely and undaunted, to hunt very briſkly and yet go very ſlow when upon ſcent of game. You cannot begin too early with theſe dogs, to teach them to fetch a bird and bring it after you: which will prevent their getting a habit of tearing or breaking the game. One of this kind muſt be always obliged to lay down whilſt you load: and as his buſineſs is to ſpring game, you ſhould never ſuffer him to go above ten or fifteen yards from you; and therefore take him out with others that are brought under command as ſoon as he is able to hunt. For to have good ſpaniels, they muſt be uſed a great deal. If you find any difficulty in keeping him to hunt near you, put one of his feet into his collar, and hunt him ſo for an hour or two. Frequent repetitions of this puniſhment will bring him to a ſenſe of his duty. One, two or three brace of ſpaniels well broken, may be uſed together; and they will find work enough in a large wood or thick cover. If two perſons intend hunting in a wood, it is beſt for one to go round it on the out ſide firſt, whilſt the other goes oppoſite to him a little way into the wood, and afterwards to ſink in deeper as you ſhall find occaſion: unleſs you know the moſt likely part to find game in; in which caſe you may hunt the interior part firſt. Some perſons when they want to hunt a very large wood approve of taking a brace of high mettled ſpaniels that have not been broken, to hunt cloſe, and turn them into the middle of the wood; whilſt they with their well broken ſpaniels hunt outwards. But I am of opinion that unleſs you have any extenſive woods to hunt, that ſuch dogs are more likely to hinder than add to your ſport; that it will be better to hunt with patience with only ſuch dogs as are under good command, let the woods or cover be ever ſo large.

Section II.

RULES to be obſerved for keeping DOGS In Health.

AS pointers and ſpaniels, when good of their kind and well broken, are very valuable to a ſportſman, it is worth while to take ſome care to preſerve them in health. This very much depends on their diet and lodging, frequent cleaning their kennels and giving them freſh ſtraw to lay on is very neceſſary; or in ſummer time, deal ſhavings inſtead of ſtraw, or ſand in hot weather will check the breeding of fleas. If you rub your dog with chalk, and bruſh and comb him once or twice a week, he will thrive much the better; the chalk will clear his ſkin from all greaſineſs, and he will be the leſs liable to be mangy. A dog is of a very hot nature: he ſhould therefore never be without clean water by him, that he may lick when he is thirſty. In regard to their food, carrion is by no means proper for them. It muſt hurt their ſenſe of ſmelling, on which the excellence of theſe dogs greatly depends. Barley-meal, the droſs of wheat-flour, or both mixed together, with broth or ſkim'd milk is very proper food. For change, a ſmall quantity of ſcraps from which the tallow is preſſed by the chandlers, mixed with their flour; or ſheep's feet well baked or boiled, are a very good diet, and when you indulge them with Fleſh it ſhould always be boiled. In the ſeaſon of hunting your dogs, it is proper to feed them in the evening before, and give them nothing in the morning you take them out, except a little milk. If you ſtop for your own refreſhment in the day, you ſhould alſo refreſh your dogs with a little milk and bread. It has already been obſerved, that dogs are of a hot conſtitution; the greateſt relief to them in the ſummer, is twitch graſs or dog graſs which is the ſame thing. You ſhould therefore plant ſome of it in a place you can turn them into every morning; they will feed freely on it, be cured of the ſickneſs they are ſubject to, and preſerved from any extraordinary heat in their blood; but unleſs the graſs be of this ſort, it is of no effect. If you be not acquainted with it, any gardener can furniſh you with enough to plant, as it is a nuiſance to them, and its roots run ſo quick through the ground as to injure their crops.

On the MANGE and its Cure.

Dogs are ſubject to the mange from being fed too high, and allowed no exerciſe, or an opportunity of refreſhing themſelves with dog graſs, or by being ſtarved at home; which will cauſe them to eat the vileſt ſtuff abroad, ſuch as carrion, or even human excrement: either of theſe will heat their blood to a great degree, which will have a tendency to make them mangy. The cure may be effected by giving ſtone-brimſtone powder'd fine, either in milk or mixed up with butter, and rubbing them well every day for a week with an ointment made of ſome of the brimſtone and pork lard, to which add a ſmall quantity of oil of turpentine.

Another medicine. Boil four ounces of quick-ſilver in two quarts of water to half the quantity, bathe him every day with this water, and let him have ſome of it to lick, till the cure be perfected. Or a ſmall quantity of Troopers ointment rubbed on the parts on its firſt appearance will cure it. It will alſo free louſy puppies from their lice. Or Euphorb: Album 2 ounces, flour of ſulphur, Flanders oil of bays, and ſoft ſoap, each 4 ounces. Anoint and rub your dog with it every other day: give him warm milk and no water. The cure will be performed in about a week.

On

On Poison and its Cure.

If you ſuſpect your Dog to be poiſoned with Nux Vomica (the poiſon commonly made uſe of by Warreners, which uſually cauſes convulſive fits and ſoon kills;) the moſt effectual remedy, if immediately applied, is to give him a good deal of common ſalt; to adminiſter which, you may force open his mouth, and put a ſtick acroſs to prevent his ſhuttting it, whilſt you cram his throat full of ſalt at the ſame time, holding his mouth upwards; and it will diſſolve ſo that a ſufficient quantity will be ſwallowed to purge and vomit him. When his ſtomach is ſufficiently cleared by a free paſſage obtained by ſtool, give him ſome warm broth frequently, to prevent his expiring from faintneſs; and he will recover. This ſucceſs I have experienced. I have alſo met with this preſcription. As ſoon as you ſuſpect your dog to be poiſoned, give him a common ſpoonful of the oil of Engliſh pitch, if a large dog, or in proportion if a leſſer; which, 'tis ſaid, will carry off the malignity of the poiſon the ſame day. But of this medicine I have not had the opportunity of making trial.

To deſtroy WORMS in dogs.

Dogs are very frequently troubled with worms; but more particularly whilſt they are young. Any thing bitter, is ſo nauſeous to theſe worms, that they are very often voided by taking two or three purges of aloes, or (which is the ſame thing) Scots pills, four or five being a doſe for a large dog: this is to be repeated two or three times in a week. If this do not ſucceed, you may give him an ounce of powder of tin mixed up with butter, in three doſes, which ſeldom fails of cure. Or of the herb ſavin, dried and rubbed to powder, give about as much as will lay on a ſhilling for a doſe; which will entirely deſtroy worms and their ſeed.

On MADNESS and its Antidote.

As the human ſpecies are liable to this fatal and terrible malady from the bite of a Dog or any animal that is mad, as much as they are from one another; it is well worthy our beſt care and endeavours to find out a remedy or antidote againſt its malignity. As ſoon therefore as you find your Dog has been bitten or worried by any Dog ſuſpected to be mad, diſſolve one pound of common ſalt, in a quart of warm ſoft ſpring or running water; and let him be well waſhed therewith: If he has received no wound, you need not be under any apprehenſion for the conſequence; but if there is any wound, you muſt ſqueeze and bathe it well with your ſalt and water for half an hour, and bind a little ſalt upon the part for twelve hours; and give him the following medicine, which I am aſſured by a very ingenious farrier who has many times uſed it, never failed him of a cure.

The MEDICINE.

Take of rue ſix ounces, London treacle, garlick, ſage, and filings of pewter, of each four ounces: boil them in four pints of beer until half be waſted: the remainder to ſtand together till uſed; the doſe is ſix common ſpoonfulls twice a day till the whole be given.

To preſerve the Feet of your Dogs from lameneſs.

A Pointer ought not to be hunted oftener than two or three days in a week: and unleſs you take care of his feet and give him good lodging as well as proper food, he will not be able to perform that through the ſeaſon. You ſhould therefore after a hard days hunting waſh his feet with warm water and ſalt, and when dry waſh them with warm broth, or beer and butter, which will heal their ſoreneſs, and prevent a ſettled ſtiffneſs from fixing.

For Strains, Blows or ſmall Wounds.

If your Dog has received any little wounds by forcing through hedges, or gets any lameneſs from a blow or ſtrain; bathe the wound or grieved part with ſalt and cold vinegar (for warming it only evaporates the fine ſpirit) and when dry, if a wound you may pour in it a little Fryar's Balſam, which will perform the cure ſooner than any method that I have experienced.

On Coughs and Colds.

Dogs are very ſubject to a cough, with a very extraordinary choaking, which is often thought to ariſe from a cold or ſome inward diſorder: and I think it is often occaſioned by their eating of fiſhes bones. To guard againſt it, order your ſervants to throw all ſuch fiſhbones where the Dog can't get at them. But if the diſorder be from a cold, let bleeding be repeated in ſmall quantities if neceſſary; but if it be what is called *the diſtemper* in Dogs, and they appear to be very low in ſpirits, bleeding is better omitted. Let meat broth or milk broth warmed be the chief of his diet, and the following medicine. Take flour of ſulphur, cold drawn linſeed oil, and ſalt-petre, of each one ounce; divide it into four doſes, giving him one doſe every other day; and let him have plenty of clean ſtraw to lie on. Or one ſpoonfull of common ſalt and one ſpoonfull of honey daily.

These rules for the care and training of Dogs are ſuch as the courſe of my experience has ſuggeſted to me, without pretending to preſcribe for others of more extenſive practice and experience; but what is here deliver'd may not be unuſeful to thoſe who want ſome previous inſtructions in the affair.

FOR the information and ſatiſfaction of my readers, I have here inſerted an abſtract of the two late Acts of Parliament, viz. That of the 2d. of George III. and that of the 10th. of George III. for the better preſervation of the Game, whereby they may the better know the reſpective Time when they may begin, and when they are to leave of ſporting, and alſo the penalties and puniſhments of infringing or breaking the above acts.

The Statute of the 2d. of George III. for the better preſervation of the game, enacts, That no perſon after the firſt day of June 1762, ſhall upon any pretence whatſoever, take, kill, deſtroy, carry, buy, or have, in his, her, or their poſſeſſion, or uſe, any partridge between the 12th day of February and the 1ſt of September, or any pheaſant between the 1ſt day of February and the 1ſt of October, or any heath fowl, commonly called black game, between the 1ſt day of January and the 20th of Auguſt, or any grouſe (commonly called red game) between the 1ſt day of Dec. and the 25th day of July in any year. Perſons offending in any of the aforeſaid caſes, forfeit five Pounds per bird to the proſecutor. The whole of the above penalties may be ſued for and recovered to the ſole uſe of the proſecutor with double coſts, and no part of the penalty ſhall be paid or applied, to or for the uſe of the poor. Proſecutions to be brought within ſix months next after the fact committed.

N. B. By the above Act of 2d. George III. the ſporting ſeaſon for partridge is, from the 1ſt Sept. to the 12th of Feb. both incluſive.

For pheaſants, from the 1ſt of October to the 1ſt of Feb. both incluſive.

For black game, from the 20th of Auguſt to the 1ſt of January. And

For grouſe, from the 25th of July to the 1ſt of December, and no other time. But hares are not included in this Act, they may be killed all the year, under the reſtriction in the following Act.

The late Statute of the 10th George III. for the preſervation of the game, enacts, That after the 24th of June, 1770. If any perſon ſhall take, kill, or deſtroy, any hare, pheaſant,

ſant, partridge, moor game, heath game, or grouſe in the night, between one hour after ſun ſetting, and one hour before ſun riſing, or uſe any gun, dog, ſnare, net or other engine for taking, killing or deſtroying any ſuch game in the night as aforeſaid, every ſuch perſon ſhall for the firſt offence be committed to goal for any time not exceeding ſix months nor leſs than three, and be publickly whipped. And for the ſecond offence to be impriſoned not exceeding twelve months, nor leſs than ſix, and be publickly whipped. And if any perſon ſhall upon a ſunday take kill or deſtroy any hare, pheaſant, partridge, moor game, heath game or grouſe, or ſhall upon a ſunday uſe any gun, dog, ſnare, net or other engine for taking, killing, or deſtroying any ſuch game as aforeſaid, and be convicted thereof upon the oath of one witneſs, ſhall forfeit and pay any ſum not exceeding 30l. nor leſs than 20l. One moiety thereof to go to the informer, the other to the poor of the pariſh. If no ſufficient diſtreſs can be had, the offender to be committed to goal for any time not exceeding ſix months, nor leſs than three.

N. B. By the above Act of the 10th George III. The time for ſporting is in the day time, viz. from one hour before the ſun riſes, until one hour after it ſets.

I have here alſo added an abſtract from the late Act of Parliament for preventing the ſtealing of dogs, which ſhews the great regard the Legiſlature has to the canine race.

By the Statute of the 10th George III. for preventing the ſtealing of dogs it is enacted, That after the 1ſt. day of May, 1770. If any perſon ſhall ſteal any dog or dogs of any kind or ſort whatſoever, from the owner thereof, or from any perſon intruſted by the owner thereof with ſuch dog or dogs; or ſhall ſell, buy, receive, harbour, detain, or keep any dogs of any kind or ſort whatſoever, knowing the ſame to have been ſtolen as aforeſaid, every ſuch perſon being convicted thereof upon the oath of one credible witneſs, before two Juſtices of the Peace, ſhall for the firſt offence forfeit and pay any ſum not exceeding 30l. nor leſs than 20l. and the charges of conviction. And in caſe ſuch penalty ſhall not be forthwith paid, the offender to be committed to goal for any time not exceeding 12 months, nor leſs than ſix, or until the penalty and charges are paid. Any perſon guilty of a ſubſequent offence to forfeit and pay any ſum not exceeding 50l. nor leſs than 30l. together with the charges, which penalties to be paid, one moiety thereof to the informer and the other to the poor of the pariſh. On non-payment the offender to be impriſoned for any time not exceeding 18 months nor leſs than 12, or until the penalty and charges ſhall be paid, and be publickly whipped.

Juſtices to grant warrants to ſearch for dogs ſtolen. And in caſe any ſuch dog or dogs, or their ſkins, ſhall upon ſuch ſearch be found, to to take and reſtore every ſuch dog or ſkin to the owner, and the perſons in whoſe cuſtody any ſuch dog or ſkin ſhall be ſo found, are liable to the like penalties and puniſhments. Perſons aggrieved may appeal to the Quarter Seſſions, and the determination there to be final.

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ERRATUM.

P. 89. for *lay*, read *lie*.

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